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GUIDE TO THE CLINICAL EXAMINATION AND TREATMENT OF SICK CHILDREN

CUIQUE·IN·SUA·ARTE·CREDENDUM

GUIDE TO THE CLINICAL EXAMINATION AND TREATMENT OF SICK CHILDREN

SECOND EDITION

GREATLY ENLARGED AND REWRITTEN

BY

JOHN THOMSON, M.D.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS OF EDINBURGH
PHYSICIAN TO THE ROYAL EDINBURGH HOSPITAL FOR SICK CHILDREN
JOINT-CLINICAL LECTURER ON THE DISEASES OF CHILDREN, UNIVERSITY OF EDINBURGH
HON. MEMBER OF THE AMERICAN PEDIATRIC SOCIETY

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TO

DR. EDUARD HENOCH

PROFESSOR OF THE DISEASES OF CHILDREN
IN BERLIN UNIVERSITY

IN TOKEN OF

ADMIRATION, GRATITUDE, AND ESTEEM

BY THE AUTHOR

PREFACE TO THE SECOND EDITION

In rewriting this edition, which is more than twice the size of the first, I have tried to adhere as much as possible to the original plan. I have said little about pathology, and have dealt mainly with the clinical aspects of those diseases only which are either peculiar to childhood or show characteristic differences when they occur in early life. I have not restricted myself entirely to common ailments, but have been guided in the choice of subjects by my own experience and predilections; believing that the best way to secure the reader's interest is to tell him what the writer is himself most keenly interested in.

The pages dealing with the treatment of mental defect and of rickets are reproduced, with little change, from articles contributed by me to the *Index of Treatment* (Wright & Co.), with the kind permission of the medical editor, Dr. Robert Hutchison.

I wish to acknowledge very gratefully how much I owe to Dr. J. G. Cattanach and Dr. J. S. Fowler for most helpful advice with regard to every part of the book, and to Mr. H. J. Stiles for many very valuable suggestions on surgical matters.

The illustrations are much more numerous in this than in the former edition. For some of them I am indebted to my colleagues at the Children's Hospital, Drs. Melville Dunlop, Fowler, and Drummond, and Mr. Stiles; also to Dr. H. O. Nicholson and several other friends whose names

are mentioned elsewhere. The great majority, however, are from photographs of my own patients, and for many of these I have to thank my former residents, Mr. W. J. Stuart and Drs. T. D. Hamilton, L. Fourie, G. D. Mathewson, Elsie B. Wilkie, and especially Drs. R. J. Mackessack and L. S. Milne. Dr. Milne has also kindly assisted me in proof-reading.

June 1908.

PREFACE TO THE FIRST EDITION

THE scope of this book is essentially supplementary; it is intended to supply, to practitioners and senior students, practical and useful information which, taken along with that contained in a text-book on practice of medicine, will be a help to them in the study and treatment of sick children. It is meant to act as a preparation for and introduction to, the larger, standard works on the diseases of children, and not to supersede them.

The lectures, out of which the following chapters have grown, were delivered to classes of students and graduates who were attending the clinical teaching of the Children's Hospital. The subject was therefore approached from a purely clinical standpoint, the aim being to afford such information as might render the hospital and dispensary work more interesting and instructive.

The author gratefully acknowledges the constant help and inspiration he has derived in the preparation of the original lectures, and also in writing the present book, from the text-books and other works of the late Dr. Charles West, of Drs. Ashby, Barlow, Cheadle, Donkin, Gee, Henoch, Jacobi, Eustace Smith, and many others. He would also record his special indebtedness to the works of recent American writers, particularly to the splendid text-books of Dr. L. E. Holt and Dr. T. M. Rotch.

To Mr. H. J. Stiles, Dr. Alex. Bruce and Dr. Harry Rainy,

thanks are due for the loan of the photographs from which Figs. 14, 18, and 38 were taken.

The author has also great pleasure in expressing his gratitude to his friend Dr. J. G. Cattanach for many valuable suggestions and much kind help both in the preparation of the work and in seeing it through the press.

June 1898.

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INTRODUCTION

THE subject of the diseases of children is sometimes spoken of as a speciality, but if it is to be regarded as a special field in the domain of medical science at all, it is certainly one which lies beyond, and not parallel to, that occupied by ordinary clinical medicine, and it is only through the latter that it can be reached. It is much better not to begin the study of disease in children until familiarity with its symptoms in later life has been acquired.

Infancy and childhood should then be the most interesting periods of life to the physician. It is while they last that his services are most frequently called for, and most indispensable; it is then that he can study disease in its frankest and least complicated forms; and it is then, also, that he is able most satisfactorily to control every circumstance that can act on the patient's health, and therefore ensure the best chance of recovery. It is in little children, too, that the physician's great ally, the Vis Medicatrix Naturæ, is present in fullest activity; and consequently, although the mortality is much higher in early childhood than at any other time of life, it is then also that we have by far the largest number of therapeutic successes, and are most frequently cheered by unexpected recoveries.

To the student or practitioner who has hitherto been concerned only with the examination and treatment of adults, the study of disease in childhood is indeed apt to present great difficulties at first, but when these have

been surmounted, he finds their ailments at least as easy of diagnosis and treatment as those of his other patients.

To be successful in practice among children, certain qualifications are absolutely necessary to the physician.

Firstly, he must, of course, possess a thorough grasp of the ordinary clinical methods.

Secondly, a certain amount of tact is necessary to enable him to examine the patient without arousing active opposition. Many have this tact instinctively; some only acquire it in the requisite degree with time and experience; while to those who have no liking for children, and are out of sympathy with them, it may never come at all.

Lastly, he must have made himself familiar with the chief anatomical and physiological peculiarities of childhood, so as to know what is and what is not within the normal limits; and he must have some knowledge of the nature and causes of the diseases commonest among children.

In the following pages, an attempt is made to supply this necessary information, and to indicate its relation to clinical work, in the hope of arousing some of that interest which, as Dr. Moxon said, "neutralises difficulties as alkalies neutralise acids."

GUIDE TO THE CLINICAL EXAMINATION AND TREATMENT OF SICK CHILDREN

CHAPTER I

ON GENERAL CLINICAL EXAMINATION, CLINICAL HISTORY, AND PHYSIOGNOMICAL DIAGNOSIS

General Clinical Examination

The methods of clinical examination in older children are the same as those used for adults, and can be applied in the same order. In infants and little children, however, the examination may have to be hastened and its details considerably modified, because the patient is unable to endure it for more than a very short time.

In the first place, *our methods differ somewhat in their relative value* in children and adults. Thus, inspection plays a larger part in the diagnosis of disease in infancy than it does in later life. This is partly because it is more easy of application, as children are usually stripped for examination, and are thus more easily seen. Partly also because they show more readily by their gestures and expression what they are feeling, and the signs of present disorder are less often in them than in adults obscured by the traces of past disease. Palpation also is much more applicable to children than to grown-up patients, not only because their bodies are smaller and softer, but also because they are so used to being

handled all over by their mothers and nurses that it is not to them the unusual and unpleasant process that it is to adults.

There is usually also *considerable difference in the order in which the methods are to be used.* In adults, we generally follow habitually much the same order of procedure—such as is found in the ordinary case-taking forms—although it may be varied somewhat in different cases. In children, the order is changed, in accordance with the general rule that it is always better to take the more unpleasant parts of the examination last, so that any inevitable crying and resistance may be deferred as long as possible. For example, the mouth and throat are among the last parts to be inspected. Were they examined early, in many cases the child would begin to cry, and the further investigation of his organs be rendered more difficult. Similarly, as some children are frightened by even light percussion, it is better as a rule to auscultate first, and to percuss afterwards. Again, it is important to count the pulse and respiration early, before the child has been much disturbed.

As a general rule, while in examining adults we proceed *system by system*, investigating in turn the alimentary, circulatory, respiratory, and other organs, in children we go rather *by methods*, so to speak; inspecting first as much as we can without touching, then palpating all over, then auscultating, and so on. There are, however, of course many exceptions to this rule.

Routine Examination

Before discussing the examination of the different parts of the body, it will be well to describe briefly the investigation of an ordinary case, so as to illustrate the usual order of proceeding. Of course most physicians have their own order, and that given here, which is founded on Dr. Charles

West's chapter on the subject, is only offered as one of many which work well.

To begin with, then, before the child is seen, it is well to make a few *preliminary inquiries* into his history and symptoms, so as to know to what point especially attention should be directed. It is also advisable that the child should be stripped before the examination is begun. If he is hurriedly undressed in the presence of a stranger, it is almost sure to make him cross. It is best, therefore, if possible, to begin with, to have him rolled in a blanket, with or without a loose nightdress on, and on his mother's or nurse's knee. Little children, even when they are seriously ill and feverish, are generally better there than in bed, because they feel safer and are less easily put out. If the child is able to sit up he should always be examined as much as possible sitting, and only subjected to the annoyance of being laid down when it seems quite necessary.

The investigation commences with *inspection*, but it is very important not to go close to the child and stare at him. If you do, he is very likely to cry. Sit first a little way off and finish your conversation with his mother or nurse. While you are doing so, unobserved by him, notice as much as you can. Observe his demeanour and expression, the state of his development and nutrition, his complexion, the state of his skin and hair, and the form of his head and any other uncovered parts; also whether he has signs of rickets or syphilis or any other disease past or present. Notice whether he is listless or lively, good-natured or irritable, and whether his behaviour is that of a normal child or in any way abnormal. Note also if his respiration is difficult; and, if he cries or coughs, observe the character of the sounds he makes, and count the respirations.

Then comes *palpation*, and by this time the child has got a little used to your presence, and may allow you to feel his

pulse without apparently noticing that you are doing so. It is essential to count the pulse without annoying or frightening him, because otherwise it will be so quickened by his emotional excitement that its enumeration will be useless. If the child is shy, it is always well to let his mother hold his hand in hers while you are feeling the pulse, as this makes it less likely that he will be frightened.

You will next lay your hand (*thoroughly warm, of course*) on the abdomen, before the child is laid down or his body uncovered. While palpating thus you learn the condition of the skin, its temperature (approximately), and whether it is soft and normal, or dry and harsh as in chronic wasting disease. On deeper palpation you will learn something of the size of the liver and spleen, and the presence of any abnormal swelling or tenderness. The hand may then be passed over the thorax, where you will feel the amount of rickety beading, if any be present, and the position and character of the heart's impulse. You may also find rhonchal fremitus over the lungs or a cardiac thrill. The limbs should then be felt, and their size, muscularity, and other characteristics estimated.

The hand is then passed over the head, its temperature and degree of moisture noticed, and the state of the fontanelle and the presence or absence of cranio-tabes investigated. The neck also should be felt, and the exact position of any enlarged lymphatic glands made out.

Auscultation, if the child is nervous (and clean), may be practised first by the ear being laid to the chest with only the nightdress or a handkerchief intervening. The advantage of the direct method of auscultation is that it frightens the child less. For thorough examination, however, the stethoscope should be used, and a binaural with a short chest-piece is best for most purposes. The advantage of having the chest-piece short is that, when the child is sitting on his

mother's knee, his chest is close to hers, and in examining the side which is next to her there is only room for a short chest-piece to turn in. It is well to auscultate the back first, as it is the commonest site of many lesions (*e.g.* empyema and collapse). It is also the place where fluid sounds in the bronchi are most likely to be heard, if the infant, as is probable, has been lying down.

Percussion follows auscultation. It must always be light, and care must be taken to see that the child is sitting straight. Last of all, the mouth and tongue have to be inspected and the gums and fauces seen and if necessary felt. This is the most unpleasant part of the whole process from the child's point of view, and is therefore best deferred until the end. The temperature may be taken before the examination begins or at any period during it.

Should the child be *asleep*, it is important to examine him before he wakes, so far as is possible, noting the character of his sleep, whether quiet or restless, the attitude he assumes, etc. (see p. 37). It is also very important to count the respiration and feel the pulse before the child wakes, as this may be the only opportunity of ascertaining their undisturbed condition. If the child has any noises accompanying his breathing when awake, note if they are also present during sleep, and if so to what degree. In many cases the abdomen may be palpated and the heart auscultated before the child wakes; some children are not aroused even by the use of the ophthalmoscope. If the child has to be wakened, this should be done by the mother or nurse, and in any case a strange face should not, if possible, be the first to meet his eye.

Clinical History

The importance of a full and accurate clinical history can scarcely be overestimated. It makes the physical

examination easier and shorter, and saves us from many mistakes. Such a history is generally more easily obtained in the case of children than in that of adults. Of course, as is so constantly pointed out, the child can rarely tell us much about his own troubles. On the other hand, we can usually get our facts from his mother or nurse, who have watched him hourly and to whom his least symptom is a matter of absorbing interest. Their stories, if often rambling, are at least more trustworthy than much that adult patients tell us about themselves.

The theories of the mother and nurse as to the cause of the child's illness are usually of no value, but their opinion as to whether he is getting better or worse is never to be made light of. While, however, we may often rely on the mother's description of past symptoms, we must never trust to her account of the urine or fæces, or of any other fact of the case which we can investigate for ourselves.

A detailed "method of case-taking" is certainly helpful in clinical work. The form in use at the Edinburgh Children's Hospital will be found in Appendix A. A few remarks may be made on some of the questions to be asked.

Mother's Complaints.—It is always important, to begin with, to ascertain why the mother has brought the child for advice—which of his ailments, that is to say, bulks most largely in *her* estimation.

Family History.—The family history is also important in some cases, especially in connection with the diagnosis of tubercular, rheumatic, and nervous cases. We must also inquire about the mother's health, particularly whether she was well during her pregnancy. The number of other children should also be ascertained and where the patient comes in the family; and it is well to find out whether any of the other children have suffered from tuberculosis, congenital syphilis, or any other special disease.

Previous Health and Treatment.—In investigating the former medical history of the child, we should begin by asking about the nature of the labour and the state of the child at birth. His growth and development of body and mind must then be inquired into; when his *teeth* appeared, when he first began to *walk* and to *talk*, and so on. It is of great importance also in young children to know about the previous feeding. If the child was on the breast, and if so for how long; if not, what he was given instead of the breast-milk, and at what age he first got solid food. It is also important to know what sort of a diet he has recently been getting.

You will then inquire about previous symptoms of disease. A history of "snuffles" and a peculiar rash in early infancy may be important as indicating congenital syphilis. Recurrent attacks of bronchitis, with alternate constipation and diarrhœa and muscular debility, would suggest the probability of previous rickets. The occurrence and dates of attacks of infectious disease are always important. In the case of obscure acute symptoms the fact of the patient's having been recently exposed to the infection of one of the exanthemata may greatly aid in the diagnosis, and the periods of incubation of these must be kept in mind.[1] Sometimes the fact that an attack of measles or whooping-cough has preceded an obscure illness by a few months is a point in favour of the case being one of tuberculosis. In cases of brain disease it is well to inquire as to previous otorrhœa. This condition, however, is so extremely common in childhood, especially among the poor,[2] that too much importance must not be attached to it.

[1] See Appendix B.

[2] Out of 1800 children under four years attending the Sick Children's Hospital Dispensary, 348, or 19·3 per cent., were found to be suffering, or to have suffered, from otorrhœa.

The Present Illness.—It is often very difficult to get a clear account of the present illness. It is best to begin by ascertaining its duration, and this is done by finding out the exact date when the child was last evidently in his normal state; and then to ask about the ways in which he has shown that he is not well—his sleep, appetite, energy, temper, appearance, and complaints.

Physiognomical Diagnosis

Before entering upon a description of the different organs and parts of the body, it will be well to consider briefly the advantage to be gained from a study of the expression and appearance of the child's face and the attitude of his body and limbs. This is generally spoken of as physiognomical diagnosis. It is easier in children than in older people, because the child's face is comparatively free from those lines and furrows which are regarded in adults as denoting character, and consequently it is the more easy to read when it bears the impress of disease. It is also specially useful in children. This is so partly because it frequently tells us, at once, which organ most needs investigation, and so shortens our examination; partly also because it often affords us the only satisfactory means we have of answering the very important question, "How is the child feeling?" The answer to this question may be very helpful. If, for example, the child is obviously feeling well, we can be quite sure that he has neither infantile scurvy, anal fissure, nor pyelitis, however suggestive of these diseases the other symptoms may be.

While physiognomical diagnosis, however, should be practised on all occasions, it is extremely important not to trust to it for such information as can only be acquired with accuracy by the ordinary and more laborious methods of examination. If it be employed as a substitute for, instead

FIG. 1.—Pleuro-pneumonia, before the crisis. Boy aged 22 months.

FIG. 2.—Pleuro-pneumonia, a week after the crisis. The same child.

of as an introduction to, a more methodical examination, the result will be far from satisfactory. Skill in reading the significance of the gestures and facial changes is only acquired by long practice. A few of the changes which are most frequently met with are well seen in the accompanying photographs. In indicating some of the more important points to be observed in them, I shall make free use of Professor Soltmann's observations, whose valuable paper[1] on this subject is worthy of careful study.

Pleuro-pneumonia.—The first photograph (Fig. 1) is of a boy of twenty-two months taken on the fifth day of an attack of acute pleuro-pneumonia, which involved part of the base of the right lung.

The child is too ill to notice much or to hold up his head, which is lying back on his mother's arm. His face is flushed and his eyes bright, although their expression is dull and anxious. His eyebrows are oblique from the action of the corrugator supercilii on each side along with that of the central bundle of the frontalis. His nostrils are dilated and working, the angles of the mouth are lowered and the lips slightly parted, so as to admit a little air during the laboured breathing. The general expression of the child's face is that of suffering, modified by the desire not to cry because of the pain which a long breath would cause.

Fig. 2 represents the same child nine days later, after the temperature had been normal for more than a week. The abnormal points in Fig. 1 become much more evident when you compare it with this one. Here, the child is thinner, but his general expression is that of health, comfort, and intelligent observation.

Meningitis.—Figs. 3 to 7 illustrate the physiognomy of brain disease. This is an important facies to recognise,

[1] "Ueber das Mienen- und Geberdenspiel kranker Kinder," *Jahrbuch für Kinderheilkunde*, Bd. xxvi., 1887, p. 206.

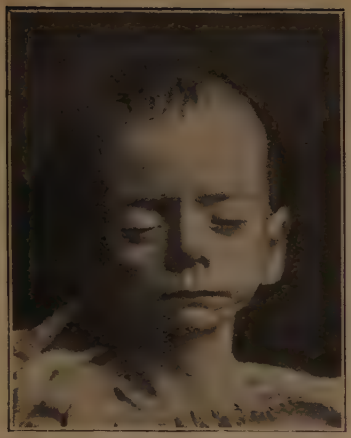


FIG. 3.—Posterior Basic Meningitis. Boy aged 3 months.

FIG. 4.—Tuberculous Meningitis. Girl aged 11 months.

FIG. 5.—Posterior Basic Meningitis. Boy aged 3 months.

FIG. 6. —Tuberculous Meningitis. Boy aged 2 years.

FIG. 7.—Same patient as Fig. 6.

because in so many cases the other symptoms of brain disease are equivocal during the early stage, and it may be doubtful whether the lesion is in the cranium, the chest, or the abdomen. Under these circumstances, much may be learned from the expression of the face.

The look that brain disease gives to a baby's face is a very strange one, because it suggests the presence of emotions which are quite foreign to infancy. This is seen in a marked degree in Figs. 3 and 5, which represent a baby of five months who was dying of posterior basic meningitis.

His eyes are closed, and he is knitting his brows. According to Professor Soltmann, it is the hyperæmia of the retina associated with the brain condition which produces this effect on the face, just as bright light might do. The central irritation is producing very tight contraction of the masseters, and there is also some retraction of the head. The general aspect of the upper half of the face is that of deep and earnest thought, while the clenched jaw and slight drawing back of the head give almost the impression of stern determination. Although the baby is much emaciated, his fontanelle is full and bulging.

Figs. 4, 6, and 7 represent infants suffering from tuberculous meningitis. The very unchildlike look of profound meditation, as well as (in Fig. 4) the squint and the unequal opening of the sightless eyes, are very noticeable.

The Hippocratic Facies of Impending Death.—Fig. 8 is of an infant, aged ten months, moribund from severe septicæmia with diarrhœa and broncho-pneumonia. The child was evidently delirious, grasping in the air in front of her, as if she saw things. Note the hollow staring eyes, the dilated nostrils, and the dropping of the lower jaw. This photograph may be taken as representing the "facies Hippocratica" as it is seen in an infant. Hippocrates, in describing a dying man, speaks of the "sharp nose, hollow eyes, collapsed temples,

the ears cold, contracted, and their lobes turned out. The skin about the forehead being rough, distended, and parched; the colour of the whole face being green, black, livid, or lead-coloured."

Fig. 8.—Facies Hippocratica. Girl aged 10 months.

Adenoid Facies.—Fig. 9 represents the common appearance of the face seen in children suffering from obstruction of the naso-pharynx by adenoid vegetations. There is a general dull expression, and the mouth is almost constantly open. The nostrils are very narrow, the alæ nasi are defective and present at the junction of the superior and inferior lateral cartilages, a more or less distinct dimple. There is often, as there was in this case, a tendency to running at the nose, and its extremity is apt to be red, especially in cold weather.

The degree to which the adenoid physiognomy is present indicates the amount of obstruction to the process of nasal breathing rather than the amount of the adenoid vegetations. The latter may be present in considerable bulk, and may be doing harm in reflex and other ways, but if they do not obstruct the free entrance of air through the naso-pharynx, they will not cause this alteration of the facial appearance.

Fig. 9.—Adenoid Facies.

Asthma, etc.—In some cases of asthma and in cases of severe chest deformity (*e.g.* from Pott's disease), in which the extra-ordinary muscles of respiration are habitually overacting, we

FIG. 10.—Acute Nephritis.

FIG. 11.—Same child after recovery.

have an opposite condition to the adenoid physiognomy. In children with such affections the eyes tend to be unusually bright, the nostrils large, well developed, and widely open, and the mouth firmly closed.

Acute Bright's Disease.—Fig. 10 shows the swollen and puffy appearance of the face characteristic of acute nephritis, and Fig. 11 the same child after recovery.

Acute Diarrhœa and Vomiting.—Fig. 12 shows a condition in some respects the exact opposite of the last. It is the common change which occurs in the face in cases of acute diarrhœa and vomiting. The main point to notice is the staring look of the eyes and the deep hollow round them. It looks as if the lids were being drawn back into the orbit. The rapid loss of orbital fat partly accounts for this appearance, but the change in the face sets in so rapidly, and in some cases passes off, or at least diminishes, so quickly under favourable circumstances, that it seems probable that muscular relaxation has a good deal to do with it also. There is along with it hollowing out of the fontanelle.

FIG. 12.—Acute Diarrhœa and Vomiting. Girl aged 11 months.

Chronic Diarrhœa.—In chronic diarrhœa there is often an expression of disgust and aversion. This is probably not due to any obscure action of the bowel disorder on the face, but the result of a constant bad taste in the mouth in a child rendered weak and irritable by exhausting disease.

CHAPTER II

SOME FACTS OF GROWTH AND DEVELOPMENT

Growth in Weight

An average-sized baby at birth weighs 7 lb. or thereby (5 to 12). During the first two days of life there is a loss of 8 to 10 oz., due partly to the passage of urine and meconium, and partly to the fact that the child does not receive enough nourishment at first to make up for the tissue waste. On the third day a steady increase begins, the birth-weight being reached again, on an average, by the tenth day of life.

After this the rise continues more or less steadily, the infant gaining from $\frac{2}{3}$ to 1 oz. daily during the first five months, and from $\frac{1}{3}$ to $\frac{2}{3}$ oz. daily during the rest of the first year. The gain may vary considerably from day to day, but the average daily increase for the week will be at about that rate.

By the end of the fourth month the baby's weight should be nearly double what it was at birth, and by the end of the first year about three times its original figure. During the second year the child gains 5 to 6 lb.; during the third, about $4\frac{1}{2}$ lb.; and during the fourth, fifth, and sixth, about 4 lb. a year. Thus by the end of the sixth year the weight is somewhere about six times what it was at birth, and at fourteen years double that amount. The average weight at any age may be seen from the accompanying charts (Figs. 13 and 14).

An infant who is very small at birth generally takes

a long time to reach the average weight. A bottle-fed baby gains more slowly, other things being equal, than a breast-baby.

Clinical Significance.—The advantage, from a clinical point of view, of weighing infants regularly is very great. As Dr. Holt says, "The weight of the infant is the best

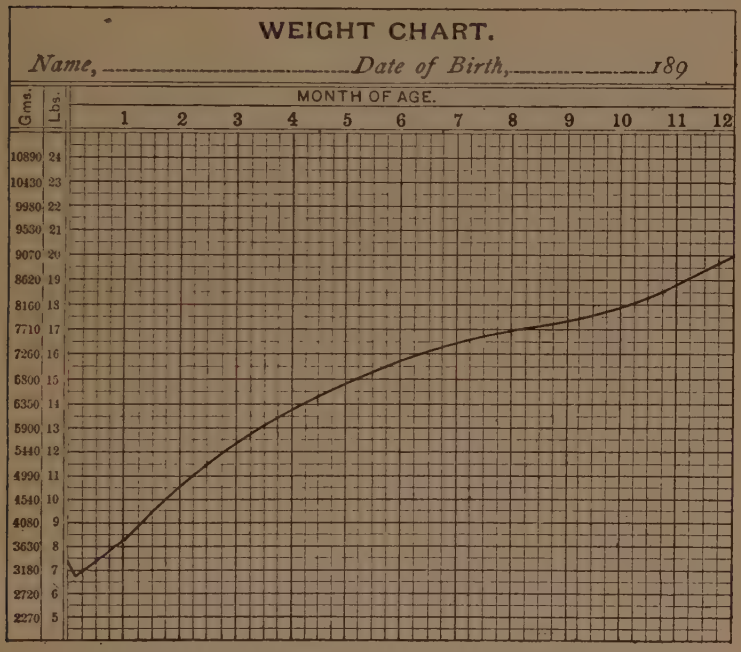


FIG. 13.—The weight curve of the first year (Holt).

means we have to measure its nutrition. It is as valuable as a guide to the physician in infant feeding as is the temperature in a case of continued fever."

By periodic weighing one can gauge the extent to which a particular diet is being assimilated by an infant much more simply and surely than in any other way. Thus we may be able to detect that a change made in the food is not

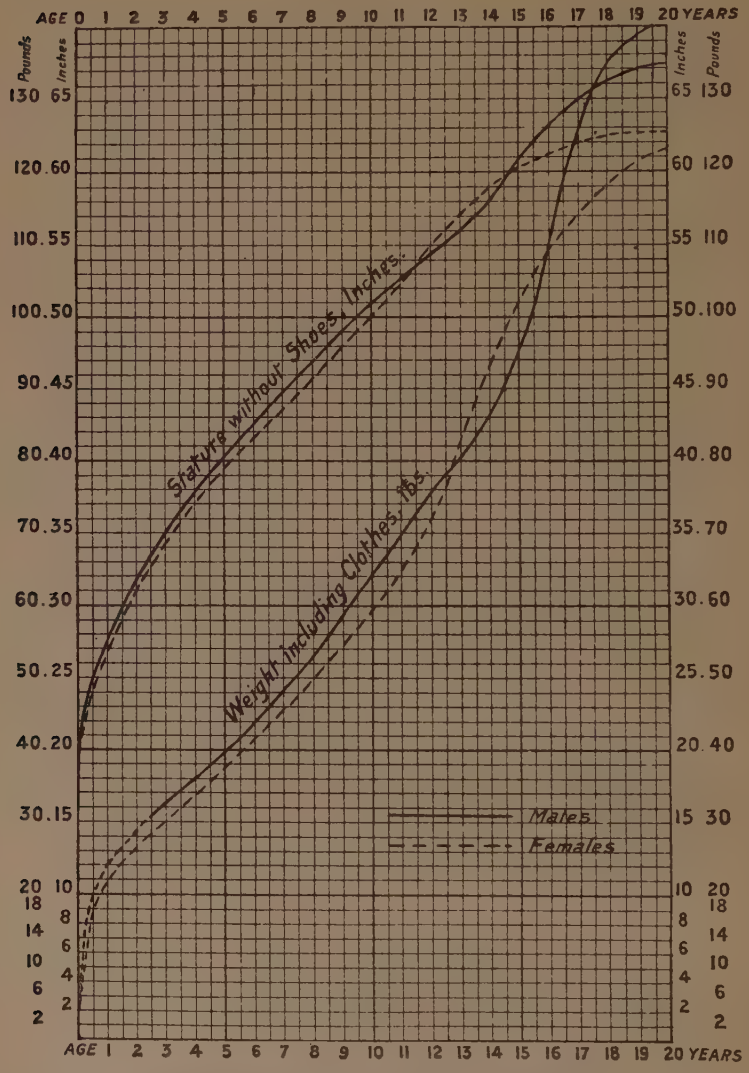


FIG. 14.—Chart showing average Stature and Weight of both Sexes under 20 years.

(*From the Report of the Royal Commission on Physical Training (Scotland)*, vol. i. 1903.)

agreeing properly, although it has not caused any of the more obvious symptoms of dyspepsia.

For example, a delicate infant is being fed on a carefully considered diet, which requires time and trouble for its preparation, and he is thriving well. For some reason, probably connected with the saving of trouble, a change is made to try whether a simpler food will not do just as well. If the new diet disagrees, it may of course give rise to obvious discomfort, or even to vomiting or diarrhœa. In many cases, however, the child seems well, and the fact that his food is not being properly assimilated shows itself only by an interference with his natural growth. He either ceases to gain as he should do, or he actually loses weight. If the baby is being regularly weighed, this loss is evident within a few days; if he is not, it may be weeks before you can be quite sure about it, and valuable time is thus lost.

Various temporary disturbances of mind or body may cause an arrest of the child's gain in weight. Many babies, for example, lose weight considerably during their first week in a hospital ward; and, thereafter, when used to their surroundings, fatten satisfactorily on the same treatment. The cutting of teeth is also apt to stop the gain in weight for the time.

If, however, a young child is losing weight, or even not gaining it for some weeks, this is to be regarded as an important morbid symptom, and its cause must be searched for. It is equivalent to progressive emaciation in an adult, and is never to be quietly acquiesced in, however well the child seems in other ways. A baby who is not gaining weight properly is failing to lay in the stock of strength by which he is to hold his own in the acute diseases of later life. Such a child, although often regarded as quite satisfactory by his parents, is really in constant danger of succumbing to

comparatively slight chest or bowel attacks which would not have harmed a better nourished infant.

In older children, also, weighing may be of service, for almost all kinds of illnesses affect the gain in weight. Thus in some institutions where children are weighed regularly as a matter of routine, it is found that the steady rise of their weight is at once checked by illness, even by a cold or a sore throat. The same thing is noticed during the incubation of measles.

Another example of the practical importance of regularly weighing children is afforded by the progress of some cases of empyema. Empyemata, in which there is a small localised collection of pus, are characteristic of childhood. These may, not infrequently, be cured by one or more aspirations. After they have been aspirated, however, it is often impossible to determine by the local physical signs whether the fluid is or is not re-accumulating. This question is usually settled if the child is periodically weighed. So long as the pus is gathering again, the child ceases to gain weight; and conversely, if there is satisfactory gain in weight, we may be sure that there is no need of further tapping.

There is one marked exception to the rule that increase of weight means improvement in health. This is in the case of dropsy. It is often seen in young babies whose limbs are apt to become œdematous in the last stages of any wasting disease.

Growth in Length

At birth the infant measures on an average $19\frac{1}{2}$ or 20 inches in length. During the first six months, he grows from 4 to 5 in., and in the second, 3 to 4 in. During the second year he gains 3 to 5 in.; during the third, 2 to $3\frac{1}{2}$; and during the fourth, 2 to 3. After this, the gain is rather less, and amounts to $1\frac{2}{3}$ to 2 in. every year. By the end of

the fifth year the child has generally doubled his original length (Fig. 14).

In children, growth in height shows distinct periodical variations. It is less marked in boys between 9 and 14, and in girls between 8 and 11, than it is immediately before and after these ages. It also varies at different seasons of the year. It is greatest in the spring and summer months (April to August), less between August and November, and least during the winter. The average height at a given age, of the children of the wealthier classes is noticeably greater than that found among the poor.

Clinical Significance.—Slow growth or arrest of growth may occur without any sign of illness, and then it is usually temporary, and need cause no anxiety. Generally, however, when a child is not growing as he should, this indicates that his general nutrition is in some way at fault. It may be due to improper hygienic surroundings, to chronic digestive disorder, or to some other morbid condition that profoundly interferes with the general health. Rickets is a common cause of stunted growth, especially when it is severe during early infancy.

In dealing with older children we must distinguish between simple arrest of growth, or **Dwarfism,** and the same condition associated with infantilism. In the former condition sexual development proceeds in the ordinary way. **Infantilism,** however, implies an absence of the usual changes in the genital organs, larynx, and elsewhere, which announce the approach of puberty, and the patient retains his or her infantile contour. It is generally associated with dwarfing, but not always.

Infantilism is found in an extreme degree in cretinism, and it is one of the symptoms to be looked for in the slight cases of that disease which are so apt to be overlooked. It has been shown that serious affections of other organs, such

as the liver [1] and pancreas,[2] may sometimes produce it; and it is not very rare in cases of protracted diarrhœa lasting for years, in which no pancreatic disease can be proved to exist. Some degree of infantilism is also common in many other prolonged debilitating diseases, such as congenital heart disease, congenital syphilis, severe tubercular bone affections, and in certain cases of cerebral diplegia and other forms of organic brain lesion.

In most cases of dwarfing with infantilism in which there is no obvious cause, it is well to try the effect of a course of thyroid substance in small doses. It is doubtful whether thyroid is ever of any use in simple dwarfing. If the dwarfing and infantilism are of a myxœdematous nature, the result of thyroid on both growth and development is rapid and striking; and there are some children whose stunted growth is due to defective thyroid action although they show no other characteristic sign of cretinism.

When we compare the *proportions* of infants with those of older children and adults, we notice that their limbs are relatively short compared with the trunk, and that the circumference of the head and abdomen are large compared with that of the thorax. This is well shown in the accompanying diagram (Fig. 15), taken from Stratz's beautiful work, *Der Körper des Kindes* (Stuttgart, 1904). These differences gradually disappear, owing to the different rate of growth of those parts.

Young parents not infrequently suffer from unnecessary anxiety on account of a supposed enlargement of the head or belly of perfectly healthy children, owing to their overlooking the above facts.

Development of Various Glandular Organs

The Salivary Glands and the Pancreas.—In young babies the mouth is noticeably dry, owing to the extreme

[1] Lereboullet, *Les Cirrhoses Biliaires*, Paris, 1902, p. 76.

[2] Byrom Bramwell, *Scottish Medical and Surgical Journal*, xiv., 1904, p. 321.

scantiness of the saliva. Not only is the saliva very small in amount, but it is also deficient in diastatic power. Ptyalin is said to occur in the saliva by the eighth week of life, but it is not until the end of the first year, when a number of teeth have usually appeared, that its amylolytic action becomes at all fully established. The action of the pancreatic secretion on starch is little, if at all, developed at birth, but by the end of the first year it is fairly established. Its proteolytic action, however, is relatively

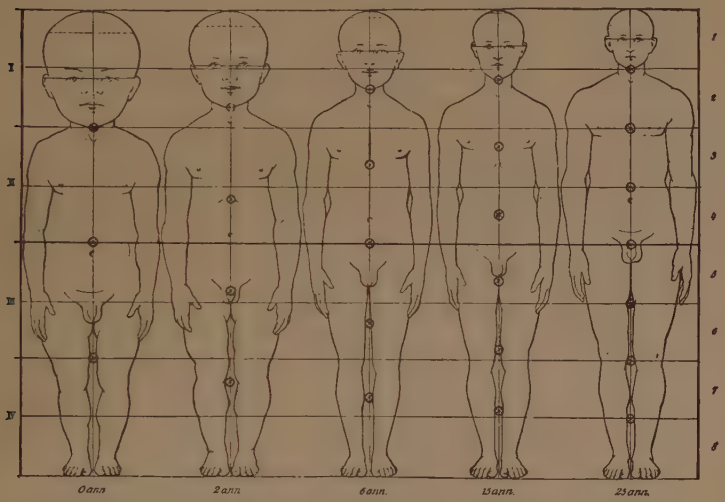


FIG. 15.—Relative Proportions of the Body at different Ages (Stratz).

well developed in the new-born child, and its action on fats is said to be active even at birth. From the slow development of the salivary and pancreatic secretions, we learn that starchy food should not be given in large quantity to young babies.

The Liver.—The liver in children is relatively large. Bile begins to be secreted early in intra-uterine life, so that, according to Zweifel, both bile acids and bile pigments may be detected in the bowel of a three-months' fœtus; and it

gradually accumulates in the intestine along with the other constituents of the meconium. The bile of children differs somewhat in composition from that of adults, but the differences have at present no practical bearing.

The Stomach.—At birth the stomach is more tubular in form than afterwards, owing to the slight degree in which the fundus is developed. It also has, and retains for several weeks, the nearly vertical position which characterises it during fœtal life, and its muscular wall is relatively feeble. During the first year the fundus increases in size more rapidly than the rest of the organ, and the stomach thus comes to lie more horizontally. The small development of the fundus in young babies accounts partially for the small amount their stomachs are able to hold. According to Holt, the average capacity of the infant's stomach is, at birth, $1\frac{1}{5}$ oz.; at three months, $4\frac{1}{2}$ oz.; at six months, 6 oz.; and at twelve months, 9 oz.

An infant's stomach does not play such an important part in the process of *digestion* as that of the adult. This is apparently because the gastric juice in the former is scantier and less powerful, and also because the stomach contents are not allowed to remain long enough in it to be completely digested. When a meal of breast-milk is taken into the stomach, the curd of it is usually coagulated within 10 to 15 minutes by the action of the rennet-ferment. This is then acted on by the acid and pepsin of the gastric juice in the usual way; but before its digestion is nearly completed, a large proportion of the meal has passed on into the bowel, to be further dealt with there. Holt says that in young infants a considerable part of the milk passes into the intestine during the first half-hour, and that by the end of an hour the stomach is often empty. The duration of the gastric digestion varies with the infant's age and with the nature of his food. Thus, while the stomach is empty

1 to 1½ hours after feeding in breast-fed babies of a month old, in those of two to eight months the average time is two hours. In the case of children fed on cow's milk the time is about half an hour longer.

The *gastric juice* contains pepsin, hydrochloric acid, and sometimes lactic acid as in adults; but it is relatively less in amount, and contains free hydrochloric acid in much smaller proportions. The small proportion of free acid is practically important, not only because of its bearing on the rapidity of digestion, but because it accounts for the fact that the gastric juice in young infants has less germicide power. This probably explains to some degree their characteristic susceptibility to gastro-intestinal infection. The mucous glands of the stomach are more numerous and the secretion of mucus more copious in the infant than in the adult.

The Intestine.—In young children the intestine differs in several respects from that of the adult. Its length, for example, is relatively greater, and its muscular wall feebler. This latter fact helps to account for the greater tendency to constipation and to flatulent distention of the abdomen in young children.

At birth the cæcum is situated relatively high up, and it is more movable than in adult life (Dwight); the ascending colon is short. The large size of the sigmoid flexure is a striking feature in the new-born child: at birth it is nearly as long as the rest of the large intestine, but by the fourth month the other parts of the colon have grown so much that the sigmoid has nearly assumed its permanent proportion to them (Rotch).

The Lachrymal Glands.—An infant usually begins to shed tears when he is between two and four months old, but sometimes this happens earlier. Rotch has observed it in a baby of a month old. When a child is very ill, tears cease

to be shed, and their reappearance is a very favourable sign and indicates the approach of convalescence.

The Sweat Glands.—Infants do not usually perspire at all during the first week of life, but there are exceptions to this rule. Perspiration is also a much less frequent accompaniment of pyrexia in children than in adults. Profuse sweating is characteristic of various morbid conditions (see Chap. VIII.).

The Sebaceous Glands.—The sebaceous glands are well developed and active long before birth, as is evidenced by the amount of vernix caseosa which they produce in intra-uterine life. During early infancy a condition of seborrhœa capitis is often met with. The excessive secretion, mixed with the dirt which it gathers, gives rise to brownish yellow closely adherent scales, which cover the vertex of the scalp, especially over and near the anterior fontanelle. Ignorant mothers are apt to allow this material to accumulate, under the impression that it affords a sort of protection to the "opening of the head," and that its removal might result in a cold. The accumulated secretion under these circumstances often sets up irritation and ends in eczema. The crusts should, therefore, be at once removed with soap and water after being soaked with olive oil.

The Testicles.—Normally the testicles pass down the inguinal canal during the ninth month of intra-uterine life. Not uncommonly, however, we meet with children in whom this process has been delayed and at birth one or both sides of the scrotum are empty. In this case the organ may appear during the first month without treatment, or its descent may be indefinitely delayed and require the attention of a surgeon. If it is delayed beyond the first year, it is usually accompanied by a hernia when it does appear. Undescended testicles are said to be almost always functionless.

The Mammæ.—All new-born babies, boys as well as

girls, have a secretion of milk in their breasts—"Witch's Milk" the Germans call it. The fluid secreted resembles adult milk in composition, and under the microscope looks like colostrum. The secretion begins in intra-uterine life, but swelling of the mammæ is usually only noticed some days after birth. It increases until about the ninth day, and then slowly diminishes. About twenty days after birth it has in most cases entirely disappeared. Occasionally it lasts for many weeks, and I have once seen greatly enlarged and secreting mammæ in a child of four months.

The swollen breasts should be carefully protected against injury and kept surgically clean. Occasionally an abscess forms in one or both of them through the entrance of pyogenic organisms (Fig. 16). These abscesses generally heal rapidly when opened in the usual way. If, however, the child is sickly, serious sloughing may occur.

Fig. 16—Mammary Abscess. Baby aged 6 weeks.

Girls between 10 and 15 years old occasionally suffer from a condition known as "irritable breast." One of the mammæ enlarges and becomes tender to touch for a while; and, after an interval, the other is often similarly affected. The condition is harmless, and requires no special treatment.

Development of the Sensory Functions and their Testing for Clinical Purposes [1]

Sight.—Very soon after birth a baby is able to distinguish light from darkness, but it is a long time before his

[1] The development of the mental functions in the child—including those of speech and of the organs of special sense—has in recent years formed the subject

eyes afford him much information. After the first few weeks most infants manifest distinct signs of pleasure when they are shown a shining object or a bright light, and a restless baby may often be quieted for examination by being carried to a window. By the third month a normal child should show that he recognises his mother's face. By the sixth, he will recognise many things; but for some time after he seems to know what they are, he will be unable to estimate their distance from him, and will grasp at them when they are quite beyond his reach.

Bright colours please even infants of a few weeks old, but the power to discriminate between colours is comparatively long of developing. Red and yellow may be recognised in the first twelve months, but blue and green not usually until the second or third year.

In older children we *test the eyesight* by the same methods as are used in examining adults. In infants and young children a thorough examination is of course impossible, but, with care, the main facts required can often be ascertained. To test a baby's power of seeing, we may watch whether his eyes follow a moving light, and if he seems to notice familiar sights unaccompanied by sounds. Thus, it may be observed at what distance he responds to his mother's smile or recognises an approaching bottle at meal times; and, when he is older, the identification of such familiar and welcome objects as a penny or an orange forms a suitable test of vision.

It should also be noticed if the pupils contract with light, and, if the child is more than a few months old, with

of a large amount of literature. The student will find much interesting information, and many references to special papers, in the following works: *The Three First Years of Childhood*, by B. Perez, transl. London, 1885; *The Senses and the Will*, and *The Development of the Intellect*, by W. Preyer, transl. Intern. Educ. Series, New York, 1888 and 1889; *The Psychology of Childhood*, by Fred. Tracy, 3rd ed., Boston, U.S.A., 1895; *An Introduction to Child-Study*, by W. B. Drummond, London, 1907.

accommodation. It is sometimes useful to test the vision by bringing the point of the finger suddenly close to the cornea without touching it, and observing whether winking is produced. In normal babies under two months, however, this manœuvre does not cause winking.

In using the *ophthalmoscope* to examine children's eyes, the indirect method is the more useful. It may be necessary to separate the eyelids gently with the finger and thumb to get a good view through the pupil, but the less the child is touched during the examination, the less likely is he to resent it. If the baby is asleep, the examination should be attempted before he awakes, as the light may not rouse him; and if it does not, there is a better chance of seeing the disc than there will be after he awakes. Remember that the distribution of the choroid pigment is often irregular in infancy, and physiological peculiarities in this matter are apt to be mistaken for the results of disease.

As Dr. Maddox has pointed out to me, the images produced by the *reflection of light on each cornea* are helpful in the examination of children's eyes in two ways. In the first place, by noticing the exact position of the image when the disc is in sight, we may be greatly helped in finding it again without losing unnecessary time. Again, the comparison of the position of the corneal images in the two eyes may lead to the detection of a squint.

Photophobia is sometimes met with as a symptom of a general morbid condition. It is common during the onset of measles and influenza, and it is also one of the early symptoms of tubercular meningitis and cerebral hyperæmia. It is of course often due to local disease of the eye, and may in rare cases be caused by peripheral irritation from the mouth.

Amaurosis.—Blindness apart from any obvious disease of the eyes occurs under various conditions in children. Habitual apparent absence of vision along with a normal

fundus and media in infants is characteristic of various forms of mental defect.

Temporary amaurosis is not uncommon after posterior basic meningitis, and may last for months and then recover completely. It is also met with in chronic hydrocephalus where the fluid is increasing, and in the course of whooping-cough and uræmia.

After severe convulsive attacks accompanied by coma, we sometimes find functional amaurosis due apparently to temporary exhaustion of the visual centres.[1] This may persist for weeks or months, and is usually associated with normal and active pupils. In examining school-children who have difficulty in reading, it is important to remember that *Congenital Word Blindness*[2] is sometimes met with. If it is not recognised, the child may be thought deficient in mind or eyesight.

Blind Children.[3]—The parents of blind children often stand greatly in need of guidance. Without it they are very apt so to treat the child in infancy that when he comes to school age he is not only unnecessarily backward but has much to unlearn. The main points to remember are that the child must always be treated, so far as is possible, as if he were able to see, and that nothing is to be done for him that he can be taught to do for himself. When he is able to crawl he must be encouraged to move about everywhere as freely as possible without getting into actual danger. In this way he learns by experience from the knocks he gets how to take care of himself. He must be

[1] Ashby and Stephenson, *Report of Society for Study of Disease in Children*, vol. iii., 1903, p. 197.

[2] James Hinshelwood, *Lancet*, May 26, 1900, p. 1506.

[3] See W. B. Drummond, "On the Early Training of Blind Children," *Pediatrics*, vii., June 15, 1899, p. 533. An excellent leaflet of *Suggestions to the Parents and Friends of Blind Children* can be obtained at the Central Office of the Charity Organisation Society, 15 Buckingham Street, Adelphi, London, W.C.

taught early to wash, dress, and feed himself. His toys are a valuable source of instruction, and do much to train the mind as well as the hands. He cannot be too carefully taught to be neat and methodical.

The wonderful acuteness of hearing and touch which blind people show is not a free gift of nature, it is simply the result of unlimited painstaking practice. To this, therefore, the child should be encouraged. The use of dumb-bells and other forms of physical drill is important, and especially open-air exercise.

Another very important thing for the parents of blind children to remember is the strong tendency they have to acquire objectionable tricks or habits, such as swaying backwards and forwards, grimacing, etc. These must be watched for and checked at once. If they are practised for any time, they are exceedingly difficult to give up. If allowed to continue, they form a serious drawback in later life.

Hearing.—During the first day or two of life all children are deaf; but by the second week, if not earlier, they should be able to hear loud noises quite well. If a child pays no attention to a loud sound behind him by the fourth week, he is probably either deaf or idiotic. By about the end of the third month the child will usually recognise the direction of a noise, and turn towards it. It is much longer, however, before children can distinguish between different sounds. Thus, among one hundred normal children, Demme found only two who seemed to recognise their mother's voice by three and a half months. Often they are much later in doing so. By six months most babies like being sung to, and young infants generally seem pleased by jingling and rattling noises.

If an infant on the bottle, who seems in good health, shows no interest when the sound of the usual preparations for a meal are being made, although he cannot see them, it

is probable that either his hearing or his intellect is at fault. In examining infants' ears, remember the shortness of the external meatus, which is such that a speculum is often scarcely necessary; and also the extreme obliquity of the tympanic membrane.

In testing a young child's hearing, a watch is of very little use. The child should be placed so that he cannot see the examiner's lips, and made to repeat short words after him.

Hyperacusia.—A tendency to start abnormally at sudden sounds is sometimes met with, especially in cases of spastic diplegia.

Deafness should of course always lead to an examination of the ears, and of the naso-pharynx for adenoids. The extreme importance of persistent treatment in ear disease in childhood need not be dwelt on. Complete deafness sometimes sets in suddenly, with no sign of middle ear disease, during non-tubercular meningitis, mumps, and whooping-cough, and in the course of congenital syphilis in older children. In such cases the prognosis as to recovery of hearing is exceedingly bad.

Deaf Children.[1]—Like the blind, the deaf and dumb child should be treated as much as possible as if he were normal. This is much easier in his case owing to his normal appearance. Indeed, he looks so normal that his deafness is often overlooked until he is two or three years old. He should be talked to just as if he heard, and encouraged always to watch the speaker's lips. He may not at first learn much in this way, but it will make the learning of lip-reading easier to him afterwards. The deaf child is too observant to learn awkward habits as the blind are apt to do. His chief morbid mental tendency is towards getting self-centred and

[1] See W. B. Drummond, "The Early Care of the Deaf and Dumb," *Pediatrics*, xii., Dec. 15, 1901, p. 440.

irritable. For this, mixing freely with healthy children is the best cure.

Both Taste and Smell are relatively well developed within the first few days of life. They do not, however, acquire a great degree of acuteness until later childhood. It is seldom necessary to test them in children for clinical purposes. When it is, familiar articles of food generally form the best tests.

The **Sensibility** of the child to **Touch, Temperature**, and **Pain** is not very acute at birth, but soon increases. The testing of these sensations in young children demands infinite tact and patience, and often leads to little result. It is always well to repeat the observations several times, on separate occasions, before being sure of their accuracy.

Thiemich has pointed out[1] that the habitual presence of general analgesia (to pin-pricks) is characteristic of imbeciles even in babyhood, and that they also often show a distinct defect of taste.

Development of the Voluntary Motor Functions

The young infant has a fair amount of muscular force at his disposal, but his movements at first are not voluntary. Some of them are *random* or *aimless*, being apparently the expression of a mere overflow of energy. Such are the grimacing, kicking, opening and shutting of the fists, and so on, which are so characteristic of the new-born baby. Others, like the blinking which follows a flash of light or a puff of wind, are simply *reflex*. The crying and sneezing of the child at birth are also of this nature.

Then there are movements which may be classed as merely *instinctive*. In these reflex action plays a certain part, but they are also definitely purposive. The human baby at birth has very few of these actions except sucking.

[1] *Deutsche med. Wochenschr.* xxvi., 1900, p. 34.

There is another interesting movement of this nature, however, which was pointed out some years ago by Dr. Louis Robinson.[1] When an adult's finger or other similar object is put within a new-born baby's grasp, his fingers close on it tightly. When the finger is raised the child's instinctive grasp is so strong that he can be lifted right off the bed without its relaxing. This power of holding on is quite different from the voluntary grasping of older babies, and it passes off within a few days of birth. Dr. Robinson inclines to connect it with the arboreal habits of distant ancestors. The so-called "infantile form" of the plantar reflex (see Chap. XVI.) is perhaps another movement of this kind. Movements which are *voluntary* as well as instinctive are only gradually acquired as the child gets older. Examples of these are—holding up the head, grasping, sitting, creeping, standing, and walking.

A baby is usually unable to *hold his head erect* until he is three or four months old, according to the degree of his muscular development.

If a finger is laid in an infant's palm it is generally promptly *grasped*, and if the child is over five months old it will probably also be carried towards his mouth. Should the child's fingers show no inclination to close on an object placed in his palm, it is a morbid sign, suggesting usually either paralysis or great mental impairment.

The power *to sit up* appears at a time which varies with the vigour of the individual baby. A child, however, cannot generally sit, even for a short time, until he is six or eight months old, and then only if carefully propped up. Not until he is eleven or twelve months old does he permanently acquire the capacity for sitting unsupported.

Some children *creep* before they walk—as early, perhaps, as the ninth month; with others, creeping is a later accom-

[1] "Infantile Atavism," *Brit. Med. Journ.*, Dec. 5, 1891, p. 1226.

plishment. A strong baby generally begins to try *to stand* by the ninth or tenth month, and may be able to do so for a little by the eleventh or twelfth. The exact time by which a child *walks alone* varies considerably in different instances, fourteen or fifteen months is perhaps the average age. Some are able to do so at one year, and some not till seventeen or eighteen months. It is well to remember Dr. Gee's axiom, that a child "who is not idiotic or weakened by some recent acute disease, and who cannot walk at eighteen months of age, is either rickety or paralysed." [1]

Backwardness in holding up the head and in other muscular movements has a similar significance to delay in the power of walking. A healthy child takes the keenest delight in the free exercise of his muscles, and any habitual disinclination to move is a morbid sign. If a young baby is swayed up and down in his nurse's arms, he shows evident signs of pleasure, and his limbs move in time with her movements. If this does not occur, and her movements arouse no answering efforts on his part, there is reason to suspect the presence of idiocy of an extreme degree.

When a child who has been walking for some time "goes off his feet," this is often a sign of advancing rickets. It may, however, be due to other general disturbances. In some children, for example, it occurs from time to time along with the appearance of uric acid crystals in the urine.

An interesting difference between the muscular action of very young infants and that of adults, due apparently to an incomplete development of the motor cortex in the former, has been pointed out by Thiemich.[2] When an adult closes his fist forcibly the flexion of the fingers is accompanied by an associated dorsiflexion of the metacarpus. Similarly, a forward movement of the metacarpus goes with forcible

[1] "On Rickets," *St. Bart. Hosp. Rep.* vol. iv., 1868, p. 72.
[2] *Zeitschr. f. klin. Med.* xlv., 1902, p. 226.

extension of the fingers, and extension and flexion of the leg are associated, respectively, with plantar flexion and dorsiflexion of the foot. The co-ordination of these associated movements is of cortical origin.

In the great majority of young infants, clenching the fist is associated with volar flexion of the metacarpus, and extension of the leg with dorsiflexion of the foot. The normal adult phenomenon only begins to be habitual in healthy children about the third or fourth month in the great majority of cases, although occasionally it is found earlier. In weakly children, even at a considerably later age (say 7 months) there is dorsiflexion of the hand on seizing a pencil; but if it is pulled away from the child, his hand at once assumes the position of volar flexion characteristic of the pre-co-ordinate period of life. This phenomenon only occurs in weakly infants, and seems to indicate how easily co-ordination is exhausted in them.

Another peculiarity in the muscular system of very young babies, which should be borne in mind, is its *hypertonicity*.[1] A certain degree of this is always present in health. Sometimes, however, it is exaggerated to such an extent as to suggest a doubt as to whether the infant is not the subject of congenital spastic diplegia. It is due, apparently, to delayed development of the cortical inhibition, and has no morbid significance. It disappears entirely as the child grows older.

Sleep

During the early weeks of life the infant should sleep nearly all the time that he is not being fed or washed or having his clothes changed—perhaps 20 hours or more out of the 24. As he grows older, his need for sleep becomes gradually less, but by the end of the first year he should

[1] Hochsinger, *Wiener med. Wochenschr.* L., 1900, No. 7, p. 314.

still be allowed from 14 to 16 hours, and during the second and third year from 12 to 14 hours in the day. One or two of these hours are to be taken in the afternoon and the rest at night. From four to five, he should have 10 or 12 hours' sleep, all at night; and from six to ten years, 10 or 11 hours. For schoolboys and schoolgirls between twelve and sixteen, 9 hours' sleep should certainly be considered the minimum allowable; and most of them will probably benefit if they can have 9½ to 10 hours regularly.[1] In the light of physiological knowledge, the idea, still held by some parents and schoolmasters, that boys are made manly by curtailing their normal amount of sleep, can only be regarded as a foolish error. Insufficient sleep is a common cause of lowered mental energy and lessened nerve force, and is very apt in delicate boys to lead to a nervous breakdown.

The *attitude* the child assumes during sleep is worthy of notice. A healthy infant generally lies on his side, or rather with his body semi-prone or prone, and his head turned face downwards on the pillow. His limbs are often fully flexed, so that the knees tend to touch the abdomen and his hands are held close up to his chin (Fig. 17). As Prof. Henoch points out, this attitude may perhaps be regarded as reminiscent of intra-uterine life. It is apt to be altered in disease, and therefore its presence in any case is a reassuring sign.

The eyes should be closed in healthy sleep. In severe acute illness, with collapse and rapid emaciation, the eyes of the sleeping child are often partially open. This is seen also in atrophy (Fig. 17) and in extreme debility from any cause, owing probably to the lack of tone in the orbicularis muscle. Incomplete closure of the eyes during sleep, however, is not necessarily a serious symptom. In nervous, irritable children

[1] See excellent paper, *On the Hours of Sleep at Public Schools*, by T. D. Acland, M.D. (Churchill), London, 1905.

—such as grind their teeth and have night-screaming attacks—this is frequently seen after an evening party; and it merely indicates that they have had an undigestible meal or too much excitement.

The mouth should also be closed. If it is kept open habitually during sleep, this suggests the probable presence of enlarged tonsils or adenoid growths. The sudden beginning of this symptom indicates rapid swelling in the nose or at the back of the throat such as occurs in diphtheria and scarlet fever.

Young infants, after the first month or two of life, are easily disturbed, but after three or four years the child sleeps the enviably sound sleep which is so characteristic of healthy childhood, and is difficult to waken. The young child should be trained to go to sleep when left alone in bed, and not to expect to be rocked and sung to. He should, of course, always if possible occupy a separate cot. The more sleep nervous children can be induced to take, at all periods of their lives, the better it is for them—the more likely are they to grow out of their nervousness. The great importance of sleep to children with acute illness is not to be forgotten, and the patient must not be lightly wakened even for the purpose of feeding.

FIG. 17.—Atrophied Infant, aged 7 weeks. Natural attitude of upper limbs during sleep, and imperfect closure of eyelids.

The disorders of sleep will be considered later (Chap. XVII.).

SPEECH[1]

Development of Speech.—A baby's first cries, like his first movements, are instinctive, and have no intentional

[1] For the best account of speech, normal and abnormal, the reader is referred to Prof. John Wyllie's book on *The Disorders of Speech*, Edinburgh, 1894.

meaning. Soon, however, he finds that his cry results in his being fed or otherwise attended to, and so he learns to cry when he wants anything. Later he gets to know that certain words or syllables mean certain things, and that by using them he gets what he wants sooner than by indiscriminate crying.

By the time he is twelve months old he will know the meaning of a good many words, and there will be one or two articulate sounds which he habitually uses with a definite meaning. During the second year his knowledge of words increases fast, and he begins to use short phrases before the end of it. The date at which different children begin to talk varies, however, greatly, and often it is impossible to tell why it does so.

During the time that they are learning to speak, normal children almost always make use of some words of their own invention; but as their powers of talking develop, these baby-words are forgotten. Similar words are often invented by imbeciles, but in them they continue to be used during life.

Backwardness in learning to speak is a thing which naturally causes anxiety to parents. It may be explained in a number of ways—

1. It is often attributed to *tongue-tie*. This is a mistake, for while the condition may interfere slightly with sucking, and possibly, as the child gets older, with the pronunciation of certain letters, it never delays speech.

2. In some cases it is a symptom of *idiocy*; and late speech always suggests the possibility of mental backwardness.

3. Not uncommonly, slowness in acquiring speech is due to *defective hearing*. This cause is apt to be overlooked, owing to the child responding at once to loud noises, although he is sufficiently deaf to have a difficulty in noticing

and imitating the lesser variations of sound which make up ordinary speech.

4. More commonly, delay in speaking is due to *general backwardness in development* following severe illness, or accompanying some such weakening condition as rickets, and words come as the child gets older and stronger.

5. There are many cases, however, of children slow of speaking who have normal intelligence and good hearing, and who have not been recently ill. It is often impossible to tell why they do not talk soon. The main practical point is that in such cases the prognosis is generally good; and that slowness in beginning to speak is not in itself a proof of defective intelligence. Instances of intelligent children who remain dumb, without being deaf, are almost, though not entirely, confined to story-books.

Aphasia may occur in children as in adults, as the result of organic brain disease, or it may be purely functional. In the former case, it is generally, although not always, caused by disease of the left hemisphere; and it is sometimes a prodromal symptom of tubercular meningitis. In the latter, it is most frequently seen during recovery from one of the infectious diseases, such as enteric fever, whooping-cough, or measles, or in connection with an attack of chorea.

Nasal Speech, when it is habitual, is generally the result of enlarged tonsils or adenoids. When it sets in suddenly, it may be due to inflammatory swelling of the parts at the back of the throat, or to paralysis of the soft palate.

Stuttering or Stammering is sometimes met with as early as two years old in neurotic children. In these cases it is generally temporary, but it is apt to return in later childhood. Persistent stuttering rarely begins before the commencement of the second dentition. It is commoner in boys than in girls.

When young children stutter, little or nothing can be

done in the way of direct treatment. Attention should, however, be given to the general health, all sources of nervous excitement and irritation avoided, and singing and shouting encouraged as much as possible.

In older children much improvement follows careful training.[1] The child must attend to the way in which he speaks, and the mechanism of speech must be explained to him so far as he is capable of understanding it. He must be taught to speak *with voice*—that is to say, with a certain musical resonance; he must also take breath frequently while speaking, so as never to speak from an empty chest. If capable of singing, he should exercise his voice in this way regularly, and he should practise for fifteen minutes at least every day, reading special sentences which contain the sounds he has difficulty with, frequently repeated, as well as ordinary poetry and prose. The child's general health must also be attended to, and special care taken that he is not being overworked at school.

Lisping is common in a temporary form in little children. It consists in a difficulty in pronouncing some of the consonants such as *s*, *k*, *th*, and *r*, which become *th*, *t*, *s* or *f*, and *w*, respectively. In some it persists for a long time, and it may be very severe. The more aggravated forms are sometimes spoken of as *Lalling*. This condition is often met with in mentally defective children. When there is no defect of hearing, according to Ashby,[2] "marked slurring or baby language in a child of five or six years of age is almost always associated with subnormal intelligence."

Idioglossia is a term given by Hadden[3] to a very severe

[1] Full directions will be found in Prof. Wyllie's book; also in Dr. H. G. Langwill's paper on "Stammering and its Treatment by the General Practitioner," *Practitioner*, Jan. 1903.

[2] *Med. Chronicle*, Oct. 1903, p. 1.

[3] *Journ. of Mental Science*, Jan. 1891; see also W. S. Colman on "Impediments of Speech," *Allbutt's System of Medicine*, vol. vii. p. 448.

form of lalling. In it the patient habitually substitutes certain consonants which he finds easy to say (usually *t*, *d*, or *n*) for all those which he finds difficulty with. This makes his speech sound like an unknown tongue, till it comes to be analysed. The condition is commoner in boys than in girls; and the patients are usually very bright children. The peculiarity shows itself when the child begins to speak; and by the time he is about four years old, if not sooner, the mother seeks advice.

The treatment of these speech-defects consists in training the child in articulation, as deaf-mutes are trained, by the oral method. The child is placed before the teacher, who demonstrates to him, by exaggerated movements of his own lips, tongue, and larynx, the way in which the desired sounds are produced. The child is also made to practise regularly simple exercises which contain the sounds which he has most difficulty in pronouncing. It is also particularly important that the child should be separated from those who understand his peculiar jargon, so that he may be induced to take trouble to make himself intelligible.

While special treatment greatly accelerates the cure in these cases, it must be remembered that even without it, if the child's intellect is normal, there is a strong tendency to recovery. I have watched several children whose speech was badly affected in this way when they were four or five, and yet became practically normal by the time they were eight or nine, although they had had no treatment other than home and the Board School supplied.

CHAPTER III

ON THE TEETH

Dentition

A. **The Temporary Teeth.**—The temporary or milk teeth are 20 in number. The following table gives the usual average ages at which they appear:—

(1) Lower central incisors .	6 to 9 months.
(2) Upper central and upper lateral incisors . .	8 to 12 „
(3) Lower lateral incisors, and lower and upper first molars . .	12 to 14 „
(4) Lower and upper canines	10 to 22 „
(5) Lower and upper second molars . . .	24 to 30 „

In normal children the teeth usually come in pairs—a tooth on one side cutting the gum about the same time as the corresponding one on the other side. Those in the lower jaw appear a little earlier than the corresponding ones above, except in the case of the lateral incisors. The order in which the teeth make their appearance in healthy infants seldom varies much, but while the average dates of appearance are as stated above, the intervals between the cutting of the different groups of teeth often vary considerably.

Irregularity in their order, and the appearance of

teeth singly, instead of in pairs, is an indication of rickets.

Sometimes dentition commences unusually early, and it is not uncommon to meet with children whose first teeth have appeared by the time they are three or four months old. In rare cases infants are born with teeth (usually lower central incisors).

Delayed dentition is very common. Sometimes it occurs with apparently perfect health—the first incisors not showing till the child is ten, twelve, or even in rare cases fourteen months old. Generally, however, any marked retardation of dentition is attributable to disease and in the large majority of instances to rickets. If a child has no teeth at ten months he should always be examined for other signs of this disease.

It is better on the whole that the teeth should not appear through the gums too soon, as when they do so they are apt to have thin enamel and not to last so long as they might have done had their crowns had longer time to mature under the gum.

Symptoms of Teething.—In many cases nothing unusual is noticed in the general condition of the child while the teeth are making their way through the gum, and there is little or no local disturbance. It is, however, a matter of common observation that many babies are more or less out of sorts for a short time before a coming tooth appears, and are greatly relieved when the process is completed. The disturbance may be local or general, or both.

Local pain in the jaw is often evident. A teething baby keeps his lips compressed and resents any attempt to look at his gums. He often puts his fingers into his mouth as if it were uneasy, or he may screw up his face or put his hand up to his ear as if visited by a sudden twinge of pain. A closer examination shows that the saliva is greatly increased

in amount, that the gum over the coming tooth and in its neighbourhood is bright red, and the adjacent glands may be swollen and tender.

The child is often flushed and feverish, whether the local disturbance is noticeable or not; and there may be restlessness, loss of sleep, and irritability. The appetite may also be lost for the time, and the bowels may become constipated or there may be slight diarrhœa. Often the child loses weight or ceases to gain it. Less frequently, slight temporary neuroses develop, *e.g.* there may be a tendency to winking the eyes, or a frequently recurring cough, or a marked acceleration of breathing, without any pulmonary disease.

Some children have while teething a tendency to certain diseases to which they are not subject in the same degree at other times. Thus it is not an uncommon thing to find a child who with the appearance of each new group of teeth has an attack of diarrhœa or vomiting, or bronchitis, which resists treatment stubbornly while the teeth are in process of appearing, but which rapidly recovers (under otherwise similar conditions) when they are through. Similarly, we see infants with eczema who have a marked relapse with each new group of teeth; and often an obstinate eruption will disappear almost spontaneously whenever all the teeth have pierced the gum.

The Place of Dentition as a Factor in the Causation of Disease.—This is a point on which there has been great difference of opinion. It used to be thought that teething was a frequent cause of serious and fatal disease. Parents, especially the uneducated among them, are always ready to blame teething for all sorts of grave diseases. This is a dangerous belief, because there is usually associated with it the idea that, as teething is a natural process, the diseases due to it are therefore to be tolerated and not checked as they would be under other circumstances. Consequently, we often

meet with children exhausted with diarrhœa which has been allowed to go on untreated for weeks because it was held to be "only from the teeth." The diagnosis of teething as the cause of any illness will always be a popular one, because it casts no blame on the parents, as exposure to cold, improper feeding, and rickets are apt to do.

In recent years a number of medical men, in Germany and America chiefly, have gone to the opposite extreme. They say that dentition is a physiological process, and therefore does not cause disease—that "teething produces teeth, and nothing else."

We shall be nearer the truth if we avoid both extremes. There can be no doubt that teething is not in itself a cause of death, and that its influence in producing and predisposing to disease has been enormously exaggerated. At the same time it is equally certain that teething, like menstruation, pregnancy, and other natural states, is often accompanied by marked symptoms both local and reflex, and like them may produce temporarily a tendency to disease which is not present at other times.

The effect of teething on a child's health varies with his strength and especially with the state of his nervous system. While most children, fortunately, cut their teeth without anything but a slight passing indisposition, if even that, others who are rickety, neurotic, or otherwise weakly, may show signs of more or less severe reflex as well as local irritation. The symptoms which arise in this way may be alarming, not because they are themselves such as to threaten life, but because they often lead us to suspect the presence of some serious disease. When we remember the amount of general disturbance which may occur in children at an older and less sensitive age from phimosis or adenoids or the presence of worms or scybala in the bowel, we can scarcely wonder that alarming symptoms are occasionally

set up in babies by the irritation that accompanies dentition.

Diagnosis.—It is easy to ascertain whether teething is proceeding or not, but very difficult sometimes to make sure of the part, if any, which it plays in producing such symptoms as are present. For example, a case of simple bronchitis may be mistaken for one of pneumonia on account of a high temperature and rapidity of breathing which are attributable to dentition. In such a case a careful consideration of the physical signs and the absence of real dyspnœa or distress will help to decide the diagnosis. Again, children who are suffering from dyspepsia and teething at the same time may be drowsy, irritable, and feverish. They may even have head-retraction and often vomiting, so that a mistaken diagnosis of commencing meningitis is possible. The absence of a slow, irregular pulse, or of cerebral breathing, of obstinate constipation, or of a retracted abdomen, would be in favour of the less serious condition, and would incline us to suspend our judgment until further symptoms appeared. A knowledge of the physiognomy of cerebral disease will be of practical value; and the administration of a dose of an aperient may remove diagnostic difficulties to a surprising degree.

We should not, therefore, be ashamed of sometimes diagnosing teething as the cause of certain morbid phenomena in infants. This diagnosis, however (like that of hysteria in older patients), should never be made until all other causes have been most carefully excluded, and, as Dr. Donkin says, we should never be satisfied with it until the child is well.

Treatment.—The restlessness, wakefulness, and irritability of teething children is often greatly relieved by the occasional administration of a sedative. For this purpose, antipyrin in doses of one or two grains is very useful. Phenacetin (gr. i) or bromide of potash or soda (grs. ii to

iv) may also be given. Preparations of opium, including the so-called "Soothing Syrups," should never be used for this purpose. As already mentioned, an aperient such as castor oil frequently produces a marked improvement in the symptoms. Diseases which occur during dentition should be treated as at other times, and the fact that teething is proceeding affords no reason why treatment should be delayed or considered unnecessary.

Lancing the gums was at one time considered desirable in all cases of obscure illness occurring in children at the age of dentition. It is now known that such a practice is not only unnecessary but possibly hurtful in all but a few exceptional cases. When serious disease is present, it is extremely doubtful whether lancing the gums can ever favourably modify its course. If, however, the gum is swollen, red, and tense over a coming tooth, and the child is suffering local pain or showing signs of reflex nervous disturbance, there can be no doubt that judicious lancing of the inflamed gum may afford immediate relief, and it can do no harm.

B. **The Permanent Teeth.** — The permanent teeth number 32. The order and usual time of their appearance are as follows:—

First molars	6 years.
Incisors	7 to 8 „
Bicuspids	9 to 10 „
Canines	11 to 12 „
Second molars	12 to 13 „
Third molars (wisdom teeth)	17 to 25 „

The first molars appear behind the second temporary molars, while the permanent incisors, canines, and bicuspids take the places of the temporary incisors, canines, and molars. The eruption of the permanent teeth is not usually a source of

irritation either local or general in childhood; but the wisdom teeth, especially those of the lower jaw, may cause some distress when they appear.

Caries of the Teeth

Caries of the teeth is an important disease from the physician's point of view as well as from that of the dentist. Some seem to think that it is a natural and not altogether objectionable thing for the milk-teeth to become carious before they drop out to make room for their successors. This is a great mistake. The crowns of the milk-teeth should remain quite clean and white and whole until, their roots having been absorbed owing to the pressure upwards of the permanent teeth, they drop out of the mouth.

When the temporary teeth become carious, any cavities which form in them should be dealt with by the dentist as soon as possible. If this is not done the progress of the disease will probably lead not only, sooner or later, to toothache, but will interfere with mastication and, consequently, with the amount of food taken and with its digestion. We must also remember that decaying milk-teeth constitute a dangerous source of infection of the permanent ones. They are also a cause of enlargement of the tonsils and of the lymphatic glands. On the other hand, the unnecessary extraction of milk-teeth is to be deprecated, as it leads to interference with the proper growth of the jaw and the position of their successors.

Care of the Teeth.—The systematic cleaning of the teeth should be begun early, especially in delicate infants. Children can soon be taught to brush their own teeth, but at first the nurse should be instructed to remove, with a soft cloth or brush, any fragments of food that tend to accumulate. The tooth-brush should be used night and morning. Its bristles should be of unequal length and hard enough to

remove efficiently any fragments of food left between the teeth. Some simple alkaline tooth powder which is not gritty should be used, and one which is cheap is to be preferred, as it should be used very freely (Formulæ 1 and 2). Tooth powder is generally cheap if bought by the pound, but very dear if procured in small quantities.

It is also important for the health of the teeth that they should be freely used. Young children have usually a great liking for chewing things, and it is good for them to try their jaws now and then on hard biscuits or other kinds of hard and tough food of a wholesome nature. Well-meaning parents may injure their children's teeth by allowing them to have nothing to eat that is not quite soft.

There are certain medicines the taking of which is bad for the teeth—chiefly those which contain an acid or some preparation of iron. To take these through a glass tube does not efficiently protect the teeth. The only satisfactory way to do so is to make the patient use a tooth-brush with alkaline powder freely after each dose of the medicine, or to rinse out the mouth with a solution of bicarbonate of soda.

Treatment of Toothache.—The occurrence of toothache is usually an indication that the child should be put under the care of a dentist. There are, however, one or two applications to the teeth which are often of service in temporarily relieving the pain. If there is an accessible cavity, a fragment of cotton-wool dipped in clove oil and inserted into it will sometimes soothe the aching. A dose of antipyrine, phenacetin, or some other analgesic, will also at times prove successful. Considerable relief may be afforded by holding in the mouth a quantity of a hot solution of bicarbonate of soda; and lastly, a dose of Gregory's powder (grs. x to xx) will often stop the pain of a carious tooth. If there is pain over the jaw and a threatening gumboil, the old-fashioned plan of putting a stewed fig between the cheek and

the gum is a good one. Moist heat should not in such cases be applied to the outside of the face.

Dental Abnormalities

Many of the abnormalities of form of the teeth, and probably all abnormalities in their number and position, are only of interest to the dental surgeon and pathologist. There are, however, certain changes in their form which have a wider significance as giving information relating to the general health or past history of the child.

Traces of Grinding the Teeth.—We often find indications that a child grinds his teeth during sleep. This is shown by flattening of the tips of those teeth which are most prominent, and the canines are therefore most strikingly affected. This cannot arise in children from mere chewing; it is only seen when there has been habitual grinding of the teeth for a long time. It may therefore be looked upon as a physical sign of nervous irritation. The irritation which it indicates may be connected with severe brain disease (*e.g.* meningitis), or it may be of the passing and comparatively harmless sort which results reflexly from injudicious feeding, or the presence of worms, or from too much excitement in a nervous but otherwise healthy child. If we are told that a child who has markedly ground teeth sleeps quietly and well, we may suspect, as Dr. Warner says, "that it is the nurse who sleeps soundly, and not the child."

Defects in the Calcification of the Enamel.—These are often seen in the permanent and more rarely in the temporary teeth, forming a discoloured transverse furrow which passes across the front of the incisors and canines, and often also implicates the crowns of the molars. This shows that at the period of the child's life at which the calcification of that part of the enamel was proceeding, something occurred to check its progress. The condition is

analogous to the grooving of the finger nails which we observe after fevers. The calcification of the enamel of the temporary teeth takes place before birth. That of the permanent ones begins about the time of birth. A groove across the middle of the central permanent incisors may be due to an acute illness which took place in the third or fourth year. Many grooves of this kind, however, occur for which no corresponding history of illness can be obtained.

Mercurial Teeth.—This is the name given by Mr. Jonathan Hutchinson[1] to an abnormality of the permanent teeth due to interference with the development of the enamel. In his opinion this may arise either from simple stomatitis, or from that which follows the administration of mercury. The teeth are rugged, pitted, or dirty on the surface. The first molars, incisors, and canines are the teeth which show the condition most frequently; the premolars escape. The effect of the stomatitis is usually confined to an interference with the development of the enamel, and rarely of the dentine. It does not cause arrest of development of the tooth as a whole in the way that congenital syphilis does.

Congenital Syphilitic or Hutchinson's Teeth.—(Fig. 18). This variety of dental abnormality is important, because, as Mr. Hutchinson says, "It is, if taken alone, by far the most valuable of the signs by which we recognise in adolescents the effect of inherited syphilis." The characteristics of these teeth are not sufficiently known, and abnormal and peculiar teeth of other kinds are often erroneously regarded as proofs of congenital syphilis. The main points about "Hutchinson's Teeth" are as follows:—

1. It is always *the permanent teeth* which are affected thus. The temporary teeth in syphilitic infants often decay early, but they present no special peculiarities of form.

2. The only teeth which afford incontestable evidence

[1] *Illustrations of Clinical Surgery*, vol. i., 1878, p. 53.

of congenital syphilis are the *upper central incisors*. The first molars, the other incisors, and the canines often afford corroborative evidence, but they are never to be trusted to alone.

3. The characteristic peculiarities which distinguish these central incisors are as follows: They are *dwarfed*, being too short and too narrow; and sometimes the portion of the upper jaw from which they grow is also arrested in growth. They often *stand somewhat apart* and slope towards one another. They are unusually *rounded* on section; they are "*pegged*" (that is to say, the teeth are broader near the gum than at their free edge); and they are *notched*. The notch is usually shallow and the dentine is exposed at the bottom of it. It is formed by the breaking away of the imperfectly developed central portion of the edge. The teeth are generally *not of a good colour*, and they are *abnormally soft*, so that by the time the patient is 20, they may be ground down like those of an old man.

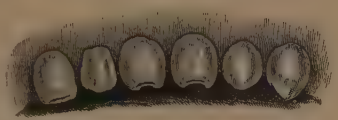


FIG. 18.—Shape of teeth in congenital syphilis (after Hutchinson).

The first molars are next in diagnostic importance to the upper central incisors. When characteristic they are spoken of as "dome-topped." Their sides slope towards the centre, over which the enamel is defective. As might be expected, syphilitic teeth not infrequently present the characteristics of mercurial teeth in addition to their own.

CHAPTER IV

ON THE EXAMINATION OF THE HEAD, NECK, BACK, AND LIMBS

The Head

The size, shape, and ossification of the cranium, including the condition of the fontanelle and sutures, are the main points to which attention should be directed in examining the head.

Size.—At birth, the circumference of the infant's head measures, on an average, 13 to 13¾ inches. At first it grows rapidly, so that it has usually gained 3 inches by the time that he is six months old, and by the end of the first year measures about 18 inches. During the second year the circumference increases by about 1 inch. At five years old the average child's head measures from 20 to 20½ inches, and at ten about 21 inches.

The normal variations in the size of the head are considerable, and sometimes children are seen with curiously long and large heads, whose intellectual development is quite satisfactory. As a general rule, where the head is unusually small or large from causes which interfere with the health of the brain, there will also be found some characteristic change in its shape. It is only when the variations in size are great that they are to be considered really morbid. In many mentally defective children the head is abnormally small, although only a few are, strictly speaking, cases of microcephalus.

Shape.—Asymmetry of the cranium is frequently seen

in infants who are otherwise normal or merely rickety, and the condition is of no practical importance.

Microcephalic crania (Figs. 19 and 20) are recognised not only by their small size, but also by their peculiar shape. The forehead is very small and receding, the vertex somewhat pointed, and the occiput flat. The fontanelle is either closed at birth or closes prematurely.

In *hydrocephalus* (Figs. 21 to 26) the head is not only enlarged both antero-posteriorly and from side to side, but its shape is more globular than in any other condition. In

FIG. 19.—Microcephalus. Girl aged $4\frac{3}{4}$ months.

FIG. 20.—Microcephalus. Girl aged 2 years.

doubtful cases we are helped in the diagnosis by observing the somewhat downward direction of the eyes, which is shown by the high level at which the lower lid crosses the eyeball and the unusual amount of sclerotic seen above the iris. The large and bulging fontanelle, which is often patent up to four or five years of age, is also a striking feature, and the defective ossification of the edges of the cranial bones resulting from internal pressure. When the head has recently enlarged, the superficial veins of the scalp are usually dilated.

The chief characteristic of the ordinary *rickety cranium* is

FIG. 21.—Girl aged 4 months.

FIG. 22.—The same.

FIG. 23.—Boy aged 18 months.

FIG. 24.—The same.

FIG. 25.—Boy aged 12 years.

FIG. 26.—The same.

CHRONIC HYDROCEPHALUS.

its squareness (Figs. 27, 131, and 132), the top of the head, the sides, and the face all tending to be flatter than usual. The head itself is usually rather larger than it should be for the child's age, and a good deal too large for the size of his body.

In many cases of rickets the form of the head becomes further changed by the outgrowth on its surface of osteophytic nodes, or bosses, as they are usually called. These are bony thickenings of the outer table of the skull, and they sometimes grow until the bone is fully half an inch in thickness. When they are large, the skull is sometimes described as natiform, and the fitness of this name can be readily ap-

FIG. 27.—Rickets. Boy aged 2½ years. Square shape of head.

preciated by looking at Figs. 28 to 33. These represent the appearance of the head at different ages in two boys, the first of whom was certainly, and the other probably, syphilitic as well as rickety. When both rickets and congenital syphilis are present, bossing is commoner, and also greater in degree, than it is in cases of simple rickets. Such an extreme degree of bossing as is shown in Figs. 28 to 33 is usually associated with great enlargement of the spleen in infancy, and with very stunted growth of the whole body in later life.

Soft, fluctuating, asymmetrical swellings on the surface of the cranial bones are sometimes formed by abscesses over *tuberculous bone disease* (Fig. 34); and a very similar condition may, rarely, be met with in congenital syphilis.

FIG. 28.—J. S., aged 12 months.

FIG. 31.—J. P., aged 12 months.

FIG. 29.—J. S., aged 2 years.

FIG. 32.—J. P., aged 2 years.

FIG. 30.—J. S., aged 11 years.

FIG. 33.—J. P., aged 11 years.

NATIFORM CRANIA.

The Ossification.—This is investigated by palpating the anterior fontanelle, the sutures, and the parietal and occipital regions (for craniotabes).

The Fontanelle.[1]—In the cranium of the new-born child there are six fontanelles situated at the various corners of the parietal bones. Except in some cases of rickets and hydrocephalus, the posterior and the four lateral fontanelles are

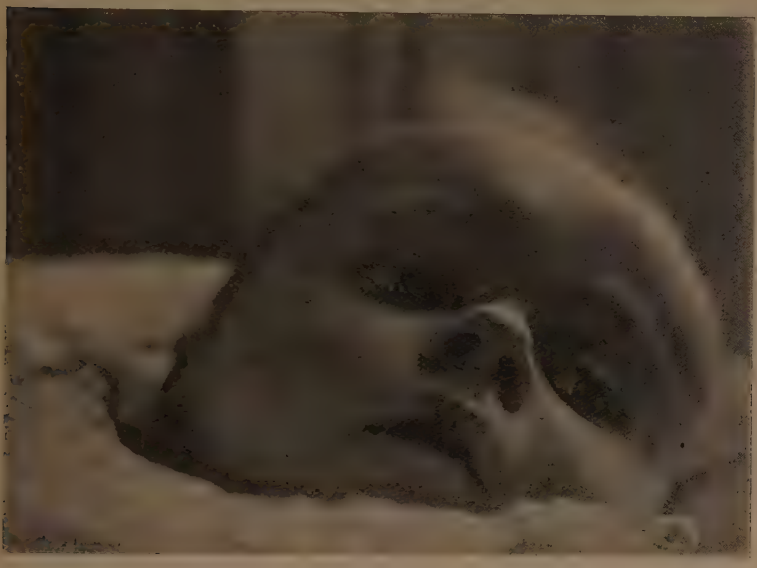


Fig. 34.—Tubercular Disease of the Frontal Bone.

quite closed within a few weeks of birth. The anterior, therefore, is the only one which is of much clinical importance, and it is generally spoken of as "the fontanelle." The characteristics of the normal fontanelle which have to be noticed are its shape, edges, tension, level, pulsation, and size.

In *shape* the anterior fontanelle is somewhat rhomboid, with slightly curved borders which are convex inwards. Its

[1] See C. Hochsinger, "Studien über die klinischen Verhältnisse der Stirnfontanelle," *Wiener Klinik*, July, August, 1892.

bony *edges* are felt distinctly at their junction with the membrane, and are somewhat rounded. Should they be so thin and yielding that there is difficulty in determining where the bone stops and the membrane begins, this indicates cranial rickets or long-continued increase of the intra-cranial pressure, or both.

The fontanelle, like the eyeball, has a normal *tension*. Its membrane is stretched somewhat tightly between the bony edges, and is at about the same level as they are. Any change in the intra-cranial pressure affects the tension and *level* of the fontanelle, so that it either bulges out above the surrounding bones or becomes depressed and hollowed out. There is normally a rhythmic *pulsation* of the fontanelle transmitted from the intra-cranial arteries. When investigated by the sphygmograph,[1] the tracing of this pulsation is found to have an anacrotic character, and also to show slight irregularities due to the respiratory movements (Fig. 35). The pulsation is increased if the tension is moderately raised, but ceases if it is either greatly raised or lowered to any considerable extent. If the ear or the end of a stethoscope is applied over the fontanelle, a systolic *murmur* can often be heard. This murmur has been much studied, but so far as our present knowledge goes it is of no diagnostic value.

The *size* of the fontanelle is the last point. It normally closes in the second year—generally between the fifteenth and eighteenth months. Whether it steadily decreases in size from birth until its closure (Kassowitz), or first increases for several months and then diminishes, as most authorities have stated, is still a matter of dispute. If the area amounts to a square inch at eight months old, we may regard it as too large.

[1] H. O. Nicholson, art. "Pulse," *Encyclopædia Medica*, vol. x. p. 208; R. Hutchison and George Elder, *Edin. Hosp. Rep.* vol. iii., 1895, p. 268.

The conditions of the fontanelle which are most important from a clinical point of view are as follows:—

1. *Alterations in size and date of closure.*

(*a*) Delay in the normal closure of the fontanelle and its enlargement are caused by three morbid processes. Firstly, it may be due to hydrocephalus or any other morbid condition which increases the cranial contents. Secondly, and much more commonly, it is caused by rickets—so that if the fontanelle is large at eighteen months, or open at all after the second year, rickets should always be suspected. Thirdly, in untreated cretins and in some other dwarfs the fontanelle shows no tendency to close in childhood, and may be found widely open in adults of thirty or forty years old.

FIG. 35.—Tracing of Normal Fontanelle Pulse from an Infant of 4 months. Dudgeon's sphygmograph (Dr. H. O. Nicholson).

Simple malnutrition does not seem to delay the closing of the fontanelle.

(*b*) Premature closure is a valuable early sign of microcephalus, in which condition it may be quite closed at birth, or may close within the first few months of life.

2. *Alterations in the tension and level of the fontanelle.*—These are extremely important owing to the information they supply as to the intra-cranial tension; thus—

(*a*) Slight increase of its tension with some slight bulging outwards is caused by cerebral hyperæmia, active or passive. We see it therefore in acute feverish conditions, in whooping-cough or chronic bronchitis, and always, temporarily, when the child coughs or cries.

(*b*) Great tension with marked bulging indicates a considerable increase in the contents of the skull, such as is found in effusion into the ventricles or in cerebral tumour. It is seen also in new-born children when there has been an extensive intra-cranial hæmorrhage.

(*c*) Abnormal depression with diminished tension of the membrane indicates lowering of the vital powers. It is met with in acute cases of diarrhœa, from the rapid loss of fluid which takes place. It is also characteristic of cases of wasting from any cause.

In cases of diarrhœa with cerebral symptoms ("hydrocephaloid") the presence of this sign is most useful in helping to distinguish the condition from real hydrocephalus (meningitis). When it is present to a marked degree in diarrhœa, it is to be regarded as an urgent indication for the free use of stimulants and external warmth.

(*d*) A condition of normal tension of the fontanelle, along with cerebral or meningeal symptoms, is often met with and is of great diagnostic importance. It occurs, *e.g.*, in some cases of "cerebral" pneumonia (that is, cases of pneumonia in which there are prominent cerebral symptoms, such as delirium, head-retraction, and fits), and it is sometimes of value in differentiating these from cases of pneumonia complicated by meningitis. It is also useful in the diagnosis of cases of enteric fever with cerebral symptoms from meningitis. Generally speaking, it may be said that in feverish cases in young babies cerebral symptoms do not indicate the presence of intra-cranial disease unless they are accompanied by a bulging fontanelle. We occasionally, however, meet with distinct exceptions to this rule.

The Sutures.—The main sutures should also be felt. Any gaping of them with thinning of their bony margins has the same significance as enlargement of the fontanelle.

Craniotabes.—Craniotabes is the name given to thinning

of the cranial bones. In its slightest form it causes a softening of their edges, with widening of the fontanelle and sutures, such as has been already referred to. When it is present to a marked degree, we find little rounded areas of thinned bone at some distance from the sutures. These yield before the point of the finger and give a slight sensation of crackling like that of parchment. They are found most frequently on the parietal and occipital bones near the lambdoidal suture, and sometimes the absorption of bone goes so far that there is nothing but a little window of membrane left at each of the affected areas.

In rare cases considerable areas of the cranial bones are membranous at birth, and for months after, without there being any signs of rickets or any indication of a cause for the condition. Craniotabes is sometimes due to chronic hydrocephalus; in the great majority of instances, however, it is merely a manifestation of rickets, and it is generally found to some degree in any young baby who has marked rachitic symptoms. The most severe degrees of this condition, however, are rarely found except in children who are syphilitic as well as rickety, and it is believed that syphilis predisposes to its occurrence.

The Neck

The neck must be examined for **enlarged lymphatic glands,** and when these are found their exact position must be noted and the area of skin or mucous membrane with which they are connected examined to discover the source of the irritation. Enlargement of the submaxillary lymphatic glands, if there is no visible cause for it on the face, generally indicates some irritation from the gums or teeth; and in the same way sores on the chin, the lower lip, or on the front of the tongue, give rise to the enlargement of the supra-hyoid gland. If, for example, a number of superficial enlarged

glands are found along the posterior border of the sterno-mastoid muscle, there probably is, or has recently been, some irritation in connection with the scalp, such as that produced by pediculi. Swelling of the posterior cervical glands is sometimes the first symptom of rötheln. It may also, sometimes, be seen in cases of erysipelas, before the rash appears.

The upper set of deep cervical glands near the angle of the jaw drain the naso-pharynx, the pharynx, and all the neighbouring parts; and as their area of distribution includes a very large amount of adenoid tissue, they are more frequently enlarged than any other. Their rapid enlargement on one or both sides generally signifies some lesion in the area which they drain; and conversely, their being of quite a normal size is in favour of there being no serious or acute throat affection.

In examining infants of a few months old, one sometimes finds a **hæmatoma of the sterno-mastoid**—or sterno-mastoid tumour, as it is sometimes called—situated in the substance of the muscle. This is due to injury of the muscle occurring during labour, but as the swelling is mainly caused by secondary overgrowth of fibrous tissue—"muscle-callus"—it is generally not discovered until some weeks after birth.

Rigidity of the neck in infants, and its **retraction,** represent two degrees of an interesting and important symptom, to which we shall return in considering the diagnosis of nervous disease. In older children a stiff neck is sometimes a manifestation of rheumatism; but it may indicate the presence of rheumatoid arthritis or cervical caries.

The Back

"In the healthy child," as Mr. Edmund Owen says,[1] "the chief feature of the spine is its suppleness—the great freedom

[1] "On Children's Spines—Healthy, Unhealthy, and Otherwise," *Pediatrics*, I., March 1, 1896, p. 193.

it possesses in all its varied movements." Even a small degree of *stiffness*, therefore, and *pain on normal movements* are to be regarded as morbid signs. They generally indicate commencing spinal caries. Also, whenever a persistent or recurrent pain in the abdomen or lower limbs is complained of, it should always direct attention to the spine.

Rickety curvature of the spine is a very common condition (Fig. 36).

FIG. 36.—Severe Rickety Curvature of Spine in boy aged 20 months.

FIG. 37.—Spinal Caries, showing acute curvature and characteristic attitude.

In most cases it takes the form of kyphosis, but the curvature differs from that of Pott's disease (Fig. 37): *firstly*, in forming a wide curve and not an acute angle; *secondly*, in disappearing when traction is made on the legs, except in severe and long-standing cases; and *thirdly*, in being unaccompanied by pain or much stiffness.

Paralysis of the muscles of the back is sometimes diagnosed as spine disease. I have known this mistake made in cases of diphtheritic paralysis, in paralysis due to tumour of the cord, and in anterior poliomyelitis.

Lordosis, which results from congenital dislocation of

FIG. 38.—Myositis Ossificans in girl aged 3 years.

both hips, is sometimes mistaken for an indication of spinal disease. The parents of mentally defective children also are very apt to attribute the inability of the children to sit up to disease of the spine.

The very rare condition known as myositis ossificans, when it begins in early childhood, generally commences in

the muscles of the back, causing flattened irregular swellings (Fig. 38). It is often accompanied by deformities of the fingers and toes (p. 81).

The Limbs

In examining the limbs, the colour and temperature of the skin are to be noted. The size and consistence of the muscles, the outline of the bones, and the presence of any tenderness or pain in these structures, are also to be observed. The joints and the hands and feet call for special attention.

The Joints

In the examination of diseased joints the following points are of importance:—

1. The *child's age*.—Some diseases only occur in infants; others only in older children.

2. The *nature of the onset* of the disease.—Whether it began insidiously or suddenly, whether it followed an injury, and whether it was accompanied by any constitutional symptoms such as fever, anæmia, wasting, etc.

3. The *distribution* of the lesion.—If one or several joints are affected, and whether the lesions are symmetrical. We have also to search for signs of disease elsewhere which may throw light on the joint condition—*e.g.* any affections of the bones or of the tendon sheathes, abscesses anywhere, disease of the heart, lungs, abdomen, lymphatic glands, teeth, eyes, or other parts.

4. The *local conditions* to be investigated by inspection; palpation and questioning include—

(*a*) The *posture* of the limb—if it is flexed or extended.

(*b*) The presence of *muscular wasting*.

(*c*) The *swelling* of the joint—its exact position and characters. This may throw light on the extent to which the

bones, ligaments, and synovial membranes are severally implicated.

(*d*) *Redness* of the skin or *distension of its superficial veins.*

(*e*) *Local heat.*

(*f*) *Fluctuation* or *thickening of the synovial membrane.*

(*g*) *Mobility*—if lessened or increased in freedom and extent.

(*h*) The presence of *crackling* sensations on moving the joint, or of any creaking of the tendons or bones.

(*i*) *Tenderness* on being touched or on passive or active movement.

(*j*) Any history of *spontaneous or other pain*, either constant or intermittent—as in the case of the "jerking pains" of tubercular joint disease.

The following are the most important joint diseases met with in children :—

Traumatic Synovitis.—Joint affections due to injury are, of course, far less common in little children than in schoolboys or young men. It should be remembered that a history of an injury is very often given in cases which turn out to be tuberculous, syphilitic, or rheumatic. The onset in a case of traumatic synovitis is usually sudden—after an injury—and there is an absence of disease elsewhere. Should the joint have been severely injured, there will generally be evidence of bruising visible under the skin within a day or two. The pain will usually be severe and the tenderness great.

While speaking of injuries, it may be mentioned that in children the *elbow joint* is much more frequently hurt than any of the other articulations. Both dislocations and fractures are common in this region, as well as separation of the epiphyses.

An interesting injury to the arm, which is not uncommon in young children, is what is called *Pulled Elbow*. This

condition is apt to be mistaken for traumatic synovitis. It consists in a subluxation of the head of the radius out of the orbicular ligament. The usual cause of the injury is a sudden jerk given to the arm when it is in the position of extension. It is apt to occur when a nurse tries quickly to stop a young child, who has tripped, from falling. Immediately after the injury the arm hangs down, as if paralysed, and is pronated and slightly flexed. Pressure over the head of the radius and all movements of the elbow cause sharp pain. Voluntary supination is impossible. The prognosis is very good as to complete recovery of movement, but the accident is apt to recur. The treatment consists in forcibly extending and supinating the forearm, while at the same time pressing the head of the radius back into its place. The arm is then fully flexed, and it is put up for two or three days in a rectangular splint.

Tuberculous Joint Disease. — Tuberculosis is the commonest cause of disease of the joints in children, and it may affect them at any age. Its onset is often very insidious, but sudden exacerbations from rupture of a focus in the bone into the joint are not uncommon. A distinct history of recent injury is frequently given; and there has often been fever, anæmia, and wasting before the joint affection was noticed. The joint disease is sometimes single, sometimes multiple, but usually not symmetrical. Other tuberculous lesions are often present in the bones, glands, lungs, abdomen, or elsewhere.

The affected limb is kept flexed, and there is generally very marked muscular wasting. There may be little or no redness, but the local temperature is usually slightly raised. The amount and character of the swelling vary, but whenever the affected joint is at all superficial in its position, the synovial membrane will be found to be thickened. Slight rigidity, with limitation of movement, is a very early and

characteristic symptom. If the affected joint is in the lower limb, lameness is generally an early symptom. The amount and character of the pain vary greatly in different cases. Sometimes it is severe. This is often so in hip-joint disease, and it is felt in the neighbourhood of the knee. The "jerking pains" at night which are characteristic of hip disease are well known. Often, however, pain is almost entirely absent in tuberculous joint disease.

Arthritis from Congenital Syphilis.—This condition is very rare in babies. It is generally met with about the time of the second dentition (6–15). The onset is insidious, and there is little or no constitutional disturbance, the child seeming merely out of sorts. The joint affection is often multiple, and the knees are the parts affected in the very great majority of cases. What is particularly characteristic is the affection of both knees at once (Fig. 39), or one after the other, at an interval of a few weeks. When a child is found to have both knees swollen and to have little pain in them, this should always suggest the probability of the case being of syphilitic origin. Often, although not always, there is other evidence of specific disease to be found on examination of the teeth, bones, eyes, or other parts. The arthritis is frequently succeeded by interstitial keratitis.

The mobility of the joint is often little affected, and it can be freely flexed and extended. The swelling is often considerable, and there may be much fluid in the joint. There is, however, little or no redness or heat to be made out, although the superficial veins are often distended. Sometimes there is marked affection of the bones. There is little or no pain in most cases—often, to begin with, merely uneasiness and tiredness after walking. Occasionally, however, the pain may be severe.[1] There is no starting at night. Suppuration never occurs. In most cases the reaction to antisyphilitic

[1] G. H. M. Dunlop, *Edin. Med. Journ.* xvi., Dec. 1904, p. 516.

treatment (mercury and iodide of potash internally and mercurial ointment locally) is rapid and satisfactory.

Acute Rheumatic Arthritis.—The age is a very important element in the diagnosis of acute rheumatism. The disease never occurs before two, and very rarely indeed before three, years old. Its onset is sometimes sudden, but generally it is gradual. Sometimes only one joint is affected at first for some time, and it is well to remember that this is, not very rarely, the hip joint. Other indications of rheumatism are

Fig. 39.—Arthritis from Congenital Syphilis.

always to be looked for and asked about—especially heart affections, rheumatic nodules, erythema circinatum, chorea, and sore throat (see Chap. XXII.).

In the early stages in slight cases there may be comparatively little limitation of movement. The child limps, however, when walking, and at rest keeps the joint flexed and still. There is much less redness, heat, and swelling than is usual in adult patients. If in any joint case in a child these are marked features, there is always a probability that the disease is not real rheumatism. The tenderness on

handling may be considerable, although not nearly so bad as it usually is in adults. Generally, according to the history given, the previous pains have been of a trivial nature, and they have often been regarded as merely "growing pains."

The pain is always rapidly relieved by the administration of salicylates.

Among the morbid conditions which I have seen mistaken for rheumatism the following may be mentioned: gonorrhœal arthritis, septic arthritis, acute infective epiphysitis, syphilitic epiphysitis, infantile scurvy, infantile spinal paralysis, tetany, and "pulled elbow."

Chronic Rheumatic Arthritis occurs rarely in children. It causes great stiffness from fibrous thickening of the joints, and there are always indications of rheumatic disease, past or present.

Gouty Arthritis is exceedingly rare in childhood. It has been recorded in a child of seven years by Sir A. Garrod. It is to be remembered that acute rheumatism may affect the metatarso-phalangeal joint of the big toe in children (Still).

Rheumatoid Arthritis or Osteo-Arthritis.—This is a rare disease in childhood, but it does sometimes occur—mainly in older children and adolescents. It resembles the adult disease in its clinical features, and, like it, is gradual in its onset and very chronic in its course. Several joints are affected and the distribution of the lesions is symmetrical. Bony changes occur in the later stages. The spleen and lymphatic glands are not enlarged; and there is no evidence of rheumatism or tuberculosis.

Still's Disease of the Joints (*Chronic Arthritis with Enlargement of the Lymphatic Glands and Spleen*).—This is a form of progressive polyarthritis which is much commoner in early childhood than ordinary rheumatoid arthritis. It used to be regarded merely as an infantile variety of the

latter disease. Dr. Still,[1] however, has given reasons for believing it to be a separate malady.

Its onset is often early—before three years old. I have seen one case which began at fifteen months. Generally the local symptoms are slight at first, though often accompanied by great debility and pallor. Sometimes, however, the onset is acute and febrile, and there may even be rigors. The joint affection consists in a fusiform enlargement of many of the articulations, and it is symmetrical in distribution (Fig. 40). The knees, ankles, and wrists are often involved,

FIG. 40.—Still's Disease of the Joints in a girl of 5 years.
(Dr. John Playfair's case.)

and affections of the cervical spine and of the sterno-clavicular and interphalangeal joints are especially characteristic. The capsule of the joint is thickened and feels pulpy, but there is little fluid effusion and no change in the bones. Suppuration never occurs. As the joints become swollen, the lymphatic glands of the affected limb enlarge considerably; and the spleen is usually also increased in size. The younger the patient the more marked is the enlargement of the glands and spleen. The movements of the affected joints

[1] *Trans. Med. Chir. Soc. Lond.* vol. lxxx., 1897, p. 47.

are little, if at all, limited in the early stages of the disease. Later, however, the limbs become drawn up and the joints stiffen. The muscular wasting is very marked. When the hand is placed on the joint during movement, slight crackling, connected with the tendons, is occasionally felt. There is generally little or no pain or tenderness. There is no tendency for this disease to be accompanied by endocarditis; but in most of the cases which have been examined post-mortem, general pericardial adhesion has been found. The prognosis is bad, owing to the great debility which is present and the consequent risk of intercurrent disease.

The treatment is not very satisfactory. It consists in life in a dry, warm climate, careful feeding, continued gentle passive and active movements of the joints. Hot salt water baths and hot air baths are sometimes also useful, and, internally, cod liver oil and arsenic.

Gonorrhœal Arthritis.—This condition, although not common, is by no means very rare in childhood. It may occur in young babies with gonorrhœal conjunctivitis or vulvitis, as well as in older children. It may set in at any stage of the disease, but usually begins between the third and sixth week.

Generally only one joint is affected, and it is a knee in the majority of cases. The sheathes of some of the tendons are also apt to be inflamed. The limb affected is kept flexed. The amount of swelling varies greatly in different cases. Suppuration is rare. In older children the local condition may be very like that met with in acute rheumatism. The pain, however, is strikingly severe even apart from movement, and the way in which salicylates fail utterly to relieve it is most characteristic.

Septic Arthritis.—Other forms of septic arthritis are met with in connection with many of the infectious diseases such as scarlet fever, diphtheria, measles, enteric, influenza,

erysipelas, and mumps. They also occur in connection with various local inflammations such as pneumonia, empyema, posterior basic and cerebro-spinal meningitis, otitis, and sore throat.

There is usually a sudden onset during the course of the primary disease. Often more than one joint is affected, and abscesses elsewhere (*e.g.* in the cellular tissue or parotid) are not uncommon. The temperature is usually remittent in type. The joint affection may not be acutely painful, and its course is sometimes subacute.

Spontaneous dislocation of the hip joint, which occasionally occurs in cases of infectious disease, is to be accounted for by softening of the capsule of the joint from latent septic arthritis.

Hysterical Joint Affections.—When hysterical affections of the joints occur in childhood, it is generally in older girls or boys; rarely, however, they are seen in quite young children. The onset is often sudden, and usually one joint only is complained of. The patient is often a noticeably nervous child.

The limb is held rigid owing to spastic contraction of the muscles. Under chloroform, however, this disappears entirely—except in a few cases of very long duration. There may be considerable wasting of the muscles in long-standing cases. The affected joint is not swollen and looks altogether normal—the pain present being out of all proportion to the objective symptoms. There is often hyperæsthesia of the skin and other superficial parts. The pain is not increased by jarring movements of the joint. When the hip joint is the part affected, the gait differs somewhat from that of ordinary hip-joint disease, and it is apt to vary in character from time to time. The lameness usually increases under observation.

It is advisable to be very slow in committing oneself to a diagnosis of hysterical joint affection, and only to give a positive opinion to that effect after prolonged study of the

case. It may not, at first, be possible to distinguish between hysteria of a joint and early tuberculosis in a very neurotic child. Amongst other things, a careful observation of the temperature may afford help in the diagnosis.

In **Hæmophilia** obstinate swelling, especially of the knee joints, sometimes occurs after effusion of blood into the joint. Joint affections are also met with in some cases of **Purpura** and of **Erythema Nodosum**, and their presence does not necessarily prove that the case is one of rheumatic origin.

The Hands and Feet

Examination of the hands and feet—especially of the former—should never be neglected. We may often gather useful information from them regarding the patient's general condition, besides noting any merely local abnormalities.

They may, for example, throw light on the state of the nervous system. In chorea, the characteristic movements are seen in them as soon as anywhere. In tetany the attitude they assume is the most noticeable feature of the disease. In young infants, a constantly clenched condition of the fists is often a sign of great nervous tension, and indicates that a convulsive attack is impending. The way in which the hand is held in certain attitudes of the arm varies in different states of vigour and lassitude of the nervous system. A knowledge of these variations may be found of considerable use in the examination of school children as to their fitness for mental work. This has been worked out in a most interesting and original way by Dr. Francis Warner in his various works.[1]

Inspection of the hands may reveal that the child habitually bites his nails (Fig. 41) or sucks his thumb.

[1] *Physical Expression*, London, 1885; *The Study of Children*, London, 1898.

The recognition of such apparently trivial facts may not be altogether valueless in certain cases.

The state of the circulation is also seen in the hands and feet, and cyanosis and œdema show early in them.

Chilliness of the Extremities is a common complaint in delicate and nervous children, especially in babies with rickets and in older children who suffer from some degree of chronic intestinal dyspepsia. The symptom causes considerable discomfort and may give rise to griping pains in the abdomen. It is probably a cause as well as a result of dyspepsia.

Fig. 41.—Bitten Finger Nails.

The treatment of cold feet and hands consists in regulation of the diet to suit the digestion, in seeing to the child's being sensibly clothed and having plenty of fresh air and exercise, and especially in the regular use of the cold douche with reasonable precautions (Chap. XXIV.).

Clubbing of the Fingers (Fig. 42).—The causation of this condition is still decidedly obscure. When it occurs, however, there is usually—probably always—some impediment to the circulation which is giving rise to engorgement of the systemic veins. The toes are often affected as well as the fingers, and sometimes the nose and ears also. The presence

of clubbed fingers is always important, and may sometimes help in the diagnosis of a lesion of the lungs or heart.

The *respiratory diseases* in which clubbing is oftenest found are phthisis, bronchiectasis, empyema, and chronic pneumonia. It may be distinct within four weeks of the onset of the symptoms of the chest disease. If the latter recovers completely, the fingers will also soon become normal. The presence of clubbing may be useful in calling our attention

FIG. 42.—Clubbing of Finger Ends, from a case of Congenital Heart Disease.

to a latent phthisis or bronchiectasis which might otherwise have escaped detection.

In *congenital heart disease* marked clubbing is frequently present. Generally it accompanies cyanosis, but not always. It may not come on until the cyanosis has lasted for years, or it may never appear. Occasionally it is present when there is no cyanosis at all. When severe in degree, it forms a bad element in the prognosis. Dr. Lees has pointed out[1]

[1] *Trans. Path. Soc. Lond.* xxxi., 1880, p. 58.

that clubbing is more likely to accompany a congenital heart lesion when the foramen ovale does not remain patent, because under these circumstances there is more tendency to congestion of the systemic venous system. Older children who have severe and long-standing *valvular heart lesions* from endocarditis may sometimes show slight clubbing of the fingers. When marked clubbing is present, however, in young children with heart disease, it proves that the lesion is congenital in origin.

Clubbed fingers have been described as occurring in *hepatic cirrhosis* (F. Taylor, P. Lereboullet) and in *amyloid disease of*

Fig. 43.—Beaded Fingers from case of Rickets.

the liver (Eustace Smith). I have seen them in a case of *congenital hypertrophy of the colon*. A slight but distinct degree of clubbing is occasionally seen in delicate young children whose circulation is obviously defective but in whom no indication of any of the above-mentioned conditions is discoverable.

The **Conformation of the Hands**, and to a less degree of the feet, may greatly help in the diagnosis of several diseases. As examples of this may be mentioned the characteristic hands of achondroplasia, which distinguish cases of that disease from those of dwarfing due to rickets (p. 489). The

shape of the hands in mongolism and cretinism is also an important diagnostic feature in these diseases (Chap. XIX.).

The extent to which the finger joints suffer in chronic rheumatoid arthritis and in Still's disease of the joints helps to distinguish these conditions from rheumatism.

The Rickety Hand.[1]—In many cases of rickets where there is much bony change, the hands are characteristically altered in outline (Fig. 43). The rickety hand is relatively long and slender. The fingers show a tendency to spontaneous hyperextension and have a peculiar beaded appearance, the

Fig. 44.—Tuberculous Dactylitis.

circumference of the joints being less than that of the middle of the phalanges. This beading, as the X-rays show, is due to elongation with narrowing of the joints and the parts adjacent, rather than to any actual thickening of the phalanges themselves (Siegert).

The presence of **tuberculous** or **syphilitic dactylitis** (Figs. 44 and 45) sometimes throws an important light on the causation of an obscure cerebral or abdominal case. These two conditions may be very like one another. The swellings of the fingers have a similar outline in both cases, and in both

[1] Siegert, *Verhandl. d. Gesellschaft f. Kinderheilk.* (Cassel), xx., 1903, p. 240; Koplik, *Arch. of Pediatr.* xxi., 1904, p. 771.

they are generally multiple. In syphilitic cases, however, the metacarpal bones are less frequently affected, and there is much less tendency to suppuration. The diagnosis is generally easily made from a skiagram, which shows the extent to which the interior and the surface of the bones are affected. In syphilitic cases, the condition is one of gummatous periostitis, the interior of the bone being either unaffected or sclerosed; while in tuberculous dactylitis any periostitis present is secondary to a caseous focus in the interior of the bone.

Fig. 45.—Dactylitis from Congenital Syphilis.

Deformities of the Thumbs and Great Toes in Myositis Ossificans.—Progressive myositis ossificans may begin in infancy. It is such a very rare disease that it need not be fully described here. It may be well, however, to draw attention to the peculiar congenital malformation of the great toes and thumbs which has occurred in so many of the published cases, that its presence affords a very important corroboration of the diagnosis in an early stage of the malady (Fig. 46). The presence of such malformations may suggest

the nature of the case even before any of the other symptoms can be recognised.

The big toes are abnormally short, and they are turned outwards, so that the feet resemble those of an adult who has worn badly made boots. The interphalangeal joints are, also, defective or absent—the phalanges being united into one

Fig. 46.—Deformities of Thumbs and Great Toes in Myositis Ossificans.

piece or one of them wanting. The thumbs are similarly dwarfed and their joints defective also. An X-ray examination of the extremities may reveal other defects of the bones, but those of the thumbs and great toes seem to be the commonest and most striking. The presence in a baby of such deformities should always draw attention to the state of the trunk muscles. In some cases the thumbs are double.

CHAPTER V

ON THE ABDOMEN

The Abdomen

Inspection.—The young child's abdomen is normally more prominent than the adult's. This is due partly to the great tendency there is to the accumulation of gas in the intestine, and to the walls of the bowel and those of the abdomen being soft and very easily distended by it. It depends partly also on the relatively large size of the liver, and on the fact that the narrowness of the thorax makes the abdomen look, by contrast, even larger than it really is.

Chronic enlargement of the abdomen is often caused by increase in size of some of its organs, or by the presence of a tumour or of ascites. The commonest cause, however, is flatulent distension. This frequently accompanies dyspepsia and intestinal catarrh. An extreme degree of flatulence is very characteristic of abdominal tuberculosis. Indeed, when it is very severe, and resists careful dietetic treatment for any length of time, it is nearly always due to this disease.

In inspecting a distended abdomen, it is important to note whether the distension is uniform or confined to one region only—*e.g.* to that of the stomach, colon, or small intestine.

In all cases of abdominal distension it is well to be on the outlook for *abdominal patterns.*[1] These are formed by

[1] Prof. John Wyllie, "The Diagnostic Value of Patterns of Abdominal Tumidity," *Edin. Hosp. Rep.* vol. ii., 1894, p. 19.

the occasional standing out in rigid spasm of the stomach, colon, or small intestine, and by the occurrence in them of marked visible peristaltic waves. With certain rare exceptions, when this occurs it may be taken as showing not only that the viscus affected is distended, but that its muscular wall is much thickened as the result of long-continued obstruction below. These patterns form an exceedingly valuable aid in determining the seat of the obstruction, besides indicating its chronic character.

Far the commonest cause in children of distinct "ladder patterns" from hypertrophied small intestine is the obstruction which sometimes develops in chronic tuberculous disease either from cicatrisation of ulcers or from adhesions. In the great majority of the cases I have seen, the obstruction has been situated in the ileo-cæcal region. Abdominal patterns of this sort call for immediate surgical assistance either in the way of excision of the strictured portion of gut or, more usually, by making a communication between the portions of bowel above and below it. In cases of congenital hypertrophy of the colon also, marked intestinal peristalsis is commonly seen.

In young babies the presence of *very marked* visible peristaltic waves over a distended stomach (Figs. 49 to 54) is practically always pathognomonic of spastic hypertrophy of the pylorus (p. 128). It must, however, be remembered that, to be characteristic of this condition, the peristalsis must be very forcible. In many wasted infants the normal movements of the stomach and bowel are quite easily visible, owing to the thinness and tonelessness of the abdominal wall. Even in some that are not emaciated there are slight peristaltic waves sometimes to be seen passing over a distended stomach. When it occurs in a chronic or subacute case, really forcible gastric peristalsis, that can be seen at a distance, always signifies great hypertrophy of the stomach

wall. If, however, it occurs in a very acute case, it may possibly be due to violent contractions of a normal stomach wall. I have only observed this once, in the case of a child of two months, who died within a few days with violent diarrhœa and vomiting, the result of some sort of irritant food-poisoning.

In inspecting the abdomen, it must also be noticed if there is any marked dilatation of the superficial veins, if the umbilicus is protruding, and if there is any tinge of redness about it. In cases of wasting, the skin of the abdominal wall often presents little colourless elevations scattered over its surface. These look like raised nodules, but on feeling them with the finger they are found to be quite soft; they are caused by dilated lymph spaces. In severe protracted cases of diarrhœa and tuberculosis, we may find small ecchymoses in the skin of the abdomen; they indicate a dangerous degree of weakness.

Retraction or hollowing out of the abdomen is a very significant indication of intra-cranial disease.

Palpation.—In palpating the abdomen, it is important to ascertain if there is any pain on pressure. This is sometimes difficult to discover, because the child may cry, when touched, from general uneasiness. If, however, the presence of tenderness can be ascertained beyond a doubt, it is very significant, and in the great majority of cases indicates the presence of peritonitis or an abscess. Absence of tenderness is less important. In many cases of peritonitis there seems to be none at all.

Owing to the thinness and softness of the abdominal walls in children, enlargement of the viscera and the presence of tumours, inflammatory swellings, or abscesses are more easily ascertained by palpation in them than in adults. For the thoroughly satisfactory palpation of the abdomen, however, *the administration of chloroform* is almost always necessary,

and a combined abdominal and rectal examination should be made.

Percussion.—Percussion is useful in determining the state of the stomach and bowel, and the relation of the latter to tumours; and also in confirming the results of palpation. It is also of great value in investigating the presence of free fluid.

The Liver.—The lower margin of the liver can usually be made out by palpation as well as by percussion. It reaches farther down in children than in adults, usually extending to half an inch below the costal margin in the right mamillary line. This is partly due to the organ being relatively larger than it is in after life, and partly to the ribs lying more horizontal, and consequently leaving more of it uncovered (Sahli).

Diminution in the size of the liver is exceedingly rare in childhood. It occurs in acute yellow atrophy, and in advanced stages of cirrhosis. Disappearance of the liver dulness is a valuable sign of the presence of gas in the peritoneum, when gastric or intestinal ulcers have perforated.

Enlargement is common, and may be due to many causes, of which the commonest is fatty accumulation. It is well to remember that a large fatty liver often has a hard sharp edge during life. Enlargement may also be due to waxy disease, cirrhosis, the passive congestion of heart failure or mediastino-pericarditis, to tumour formation, etc.

The Spleen.—The spleen is best investigated in children by palpation. To examine it, you stand on the child's right side, and, laying your right hand on the left side of the abdomen, with the first two fingers over the left hypochondrium, press inwards and upwards. In some cases where the spleen is normal in size, and always if it is enlarged, its rounded edge will be felt as a soft and readily movable body. It is always well, before beginning to feel for the spleen,

to ascertain the position of the lower costal margin, as the cartilages of the floating ribs may be mistaken for the border of an enlarged spleen. If the child allows you a fair opportunity of palpating the spleen, and you do not feel it at all, you may generally rest assured that it is not enlarged. Greatly enlarged tuberculous spleens, however, are sometimes adherent to the diaphragm, so that they cannot be felt below the ribs. If you feel it at or about the level of the costal margins, the spleen is either normal or only slightly increased in size. If, however, it is distinctly below the level of the ribs, it may be regarded as abnormally large. When great enlargement is present, the organ may reach right down into the pelvis.

Great enlargement of the spleen is frequently met with in children, and may be due to many causes. In children born with active manifestations of congenital syphilis it is probably always enlarged. In the more common cases, where the symptoms of that disease only set in after some weeks or months, it may be found before these appear; but often it comes rather late in the course of the active symptoms, and it generally persists longer than any of the other manifestations.

In rickets, enlargement of the spleen is frequently met with and it may attain considerable dimensions. It is enlarged also in typhoid fever, hepatic cirrhosis, malaria, leucocythæmia, splenic anæmia, waxy disease, and often in tuberculosis.

The Mesenteric Glands.—Tuberculous affection of the mesenteric glands is a very common condition in childhood from a pathologist's point of view. It is distinctly less so from that of the physician, because in many cases the diseased glands are so situated as to be inaccessible to palpation during life until they become very large.

Rectal Exploration.—In the examination of the abdomen

in children, rectal exploration is often extremely important. A simple examination with one finger may be sufficient, as in searching for a rectal polypus.

A bi-manual examination, however, with the forefinger of one hand in the rectum and the other hand on the front of the abdomen, is of special value in the diagnosis of many forms of abdominal and pelvic disease.[1] This method of examination should be had recourse to in cases of severe and obstinate constipation, in spinal disease with possible abscess formation, and in cases of tumour and of abdominal tuberculosis.

The patient, having been anæsthetised, is laid on his back with his thighs fully flexed on the abdomen and a pillow under his pelvis. With the right forefinger in the rectum and the left hand over the front of the abdomen, the right side of the pelvis and abdominal cavity as far as can be reached may now be explored very satisfactorily. The physician then stands on the child's left side and examines with his left forefinger in the rectum and his right hand palpating in front. In this way, besides feeling any enlarged glands or other hard swellings that are present, he may be able to discover any thickening or matting of the intestine that has been left by former inflammatory attacks.

Hernia.—Umbilical hernia is often seen in infants. It is readily recovered from in most cases if the protrusion is kept back constantly for a few weeks or months according to its size; and this is generally easily done by keeping a broad strip of ordinary sticking-plaster over it.

Inguinal hernia of various kinds is common in early childhood, but femoral hernia is practically unknown.

The treatment of hernia, although mainly surgical, has sometimes an important medical side in infants. There is a strong natural tendency for the slighter forms of rupture

[1] See George Carpenter, "On the Value of Rectal Exploration as an Aid to Diagnosis in Diseases of Children," *Pediatrics*, I., June 1, 1896, p. 481.

to be spontaneously recovered from. This, in many cases, is thwarted by constant coughing, crying, or vomiting, or by straining either at stool or during micturition, and if these adverse conditions can be removed (*e.g.* by proper dieting of badly fed infants), more may be done in this way towards the cure of the hernia than would be effected by any amount of care directed only towards the application of a truss. If, however, the crying is due to uneasiness in connection with the rupture, as also sometimes happens, then the adjustment of a well-fitting truss forms the only proper treatment.

The tendency of modern surgery is towards the belief that most, if not all, cases of congenital inguinal hernia should be treated by radical operation before the appearance of the first teeth.[1]

Defæcation

The infant's bowels generally move two or three times a day during the first week of life, and once or twice daily after that. The process should, of course, be quite easy and painless. If otherwise, the cause of the discomfort or pain requires investigation.

Scanty and infrequent motions may be due simply to the small amount of food reaching the intestine, as occurs when there is persistent vomiting, or to a variety of other causes (see "Constipation"). Painful defæcation may be due to spasm or fissure of the rectum or to tenesmus.

Rectal Spasm.—This sometimes occurs in little babies as a result either of fissure or of some other lesion of the mucous membrane left by diarrhœa. When it comes on, the infant stretches himself straight out with his head back and his thighs extended and pressed closely together; and he seems

[1] H. J. Stiles, "On the Operative Treatment of Hernia in Infants," *Brit. Med. Journ.*, Oct. 1, 1904, ii. p. 813.

in great pain until it passes off. If no fissure is present, warm water injections and hot baths are indicated. I have seen one very severe case (in a nervous, but otherwise healthy, girl of 4½ years) in which the symptoms recalled those of spasmodic dysuria. Nothing local could be found except a moderate degree of congestion of the rectal mucous membrane. The spasms were exceedingly painful, and seemed to be combined with distressing tenesmus. They yielded rapidly, however, to the treatment, which consisted in tincture of hyoscyamus (♏ xx) internally, laudanum (♏ viii) by the bowel, and a hot sitz bath.

Fissure of the Rectum.[1]—Anal fissures are by no means rare in infancy; and as they may give rise to severe and perplexing symptoms, they must not be forgotten. The lesion, if single, is most frequently situated on the posterior wall. In some cases the fissure is easily seen by merely pulling apart the edges of the anal orifice. In others a small speculum has to be used. In babies a bivalve nose speculum answers the purpose well. Should the rectal mucous membrane be partly prolapsed, as sometimes happens, it may be very difficult to find the fissure.

Cause.—In the causation of fissures two factors are to be recognised. On the one hand, there is local weakness due to lesions of the skin and mucous membrane, especially to syphilitic eruptions, eczema, and the irritation arising from diarrhœa and thread-worms. The irritation set up by the habitual use of suppositories or enemata, when these are often repeated, is also apt to cause them. On the other hand, there is the periodic over-distension of the anal ring by hard fæcal masses which takes place in constipation.

Symptoms.—The first effect of the fissure is spasm of the sphincter ani. This, of course, greatly aggravates

[1] F. Frühwald, *Ueber Mastdarm- Rhagaden und Fissuren im Kindesalter*, Wien, 1896.

the existing *constipation*. Defæcation becomes extremely painful, and the infant does all he can to postpone it. The longer the motion is retained the larger and harder does it become and the more painful is its ultimate passage. A vicious circle is thus set up. The motions when passed are often tinged with *blood*. The vague sickening *pain* which the child suffers has a marked effect on his appearance. He has a haggard, worn look, and is restless and miserable. In babies, the screaming which the rectal spasm causes is very apt to be attributed to colic, and treated accordingly. In some bad cases the irritation spreads to the nerves of neighbouring parts. The surrounding skin may become tender to touch, or there may be reflex erections of the penis or *spasmodic retention of urine*. This last-named symptom is one which should always draw attention to the state of the anal orifice. General irritability, sleeplessness, night-screaming, and even convulsions, may owe their origin to this small lesion.

Treatment.—The first object to be aimed at is the removal of the constipation by diet, massage, and gently laxative medicine—if possible, without the use of injections or suppositories. If the motions are always soft and the parts round the anus are kept clean and the orifice itself is anointed with suitable ointment, recovery usually takes place in a short time. The ointment which I have found most useful is one containing ichthyol and tannic acid, a drachm of each to the ounce of vaseline. It is to be gently inserted on a firmly rolled-up pledget of cotton-wool. Should the anal spasms continue, a five-per-cent. cocain ointment may be applied and a hot bath given. Only rarely is it necessary to have recourse to division or stretching of the sphincter.

Tenesmus.—Straining at stool is a common symptom in childhood. It is present more or less in all cases where the

lower part of the bowel is irritated either by any primary local disease or as the result of the passage downwards of abnormal fæces. It may also be due to lesions higher up; it is, for example, an important symptom of intussusception and of prolapse. It may be due to a stone in the bladder and sometimes to extreme phimosis. If acute, it may cause much distress. If chronic, its presence may only be indicated by the child's disinclination to rise from the chamber after each motion is passed. The symptom generally indicates the presence of a condition which will be benefited by copious irrigations with warm water. If it is severe, a starch and opium enema may be given.

Incontinence of Fæces.—Involuntary passage of the motions may be due to paralysis of the sphincter, as in some cases of paraplegia, spina bifida, etc. It often arises from mere weakness in children exhausted by diarrhœa and other debilitating conditions. In such cases no local or special treatment is called for.

Another type of case is occasionally met with which seems to be a disorder of co-ordination like enuresis. It is indeed sometimes associated with that symptom, but it is much more frequently diurnal than nocturnal. This type of incontinence of fæces is generally seen in children who are stupid and ill-regulated or show some mild degree of mental instability (Goodhart and Still). The psychical is probably more important than the physical part of the treatment.

Removal to a hospital ward sometimes checks it at once. If, as may happen, it is associated with large solid motions, it is well to begin the treatment by giving a daily morning enema. Benefit seems sometimes to follow the internal use of ergot or belladonna. Henoch recommends the subcutaneous injection of ergotin (gr. iss). He suspects, however, that the effect is largely a psychical one.

Rectal Prolapse.—There are two degrees to be observed in cases of prolapse of the rectum. In the slighter form, the prolapse consists of a ring of swollen mucous membrane which protrudes through the anal aperture when the child strains. In the severe variety of the condition, the whole thickness of the wall of the rectum is involved (Fig. 47), so that the protruding bowel corresponds to the invaginated portion of an intussusception. In these cases, the

FIG. 47.—Rectal Prolapse in a child aged 3 months.

prolapse is sometimes two or even three inches long, and it may remain constantly down.

Causation.—The greater tendency to prolapse which obtains in early life is attributed to many things. For example, the sacrum is less curved in children, the rectum straighter, and the muscles in the pelvis weaker and more yielding. The rapid wasting which so readily occurs in childhood is a strong predisposing cause of prolapse. It lessens the support afforded to the rectum by the ischio-rectal fat before the muscles have time to accommodate themselves

to the greater strain thus thrown upon them. The exciting cause is severe and long-continued straining. This may result from constipation, from thread-worms, or from diarrhœa associated with catarrh of the rectum. Extreme phimosis may also lead to it, and in older boys it is sometimes a symptom of vesical calculus.

Symptoms.—When slight in degree the prolapse only occurs during defæcation, and is readily returned. In severe cases, however, any exertion, such as crying and coughing, brings it down, and it is more difficult to return satisfactorily. When the bowel remains long down, it is apt to become inflamed and ulcerated.

Diagnosis.—There is usually little or no difficulty in recognising the nature of a rectal prolapse. Occasionally, however, a true intussusception is protruded from the anus, and this should always be suspected if there is a history of recent prolapse setting in acutely with vomiting.

Treatment.—The protruding bowel should be washed with cold water, and gently returned by pressure upwards with an oiled rag. The child should be kept lying for some time after it is returned. The treatment of the morbid condition which gives rise to the straining must be undertaken, and the administration of an iced water enema night and morning is often very helpful. To lessen the tendency to recurrence of the prolapse, the child should be encouraged to relieve his bowels when lying on his side; and if he uses the chamber, it should be placed in such a position that his legs are not touching the ground, so that he strains as little as possible. It is of great importance to diet the child carefully and to get him to become fat and firm as soon as may be.

When the tendency to prolapse is so great that protrusion of the bowel occurs apart from defæcation, the patient should remain in bed, and his nates should be kept

tightly together by means of broad straps of adhesive plaster, which are changed when the bowels move. This is a very effective measure. In severe cases, strychnine has been recommended either as an ointment or in hypodermic injections ($\frac{1}{100}$th of a grain twice daily in a child of two years: Holt); and if everything else fails, the prolapsed portion of bowel may be cauterised in such a manner as to cause cicatrisation of its mucous membrane.

Rectal Polypus.—Piles occur only very rarely in children, and never give rise to severe symptoms. When hæmorrhage from the rectum occurs as an isolated symptom in a child, the presence of a polypus should always be suspected.

Rectal polypi are most frequently situated within an inch or two of the anal orifice. They are generally fairly soft in consistence and rounded in shape, and often reach the size of a bean or a cherry. They usually cause no symptoms beyond the bleeding, though, rarely, they may be at times protruded through the anus. The hæmorrhage always follows defæcation.

The diagnosis is made by feeling round the rectum with the forefinger. Generally the polypus is easily recognised; occasionally, however, it is so soft as readily to escape detection. The treatment consists in seizing the polypus with dressing-forceps or with a wire snare and twisting it off. The cure is immediate and permanent.

The Fæces

The **Meconium** which the infant passes during the first three or four days is of a dark greenish brown colour, of a viscid semi-solid consistence, slightly acid in reaction, and without odour. At birth it is sterile; but within a few hours micro-organisms find their way into it through the anus.

It contains epithelial cells and mucus from the intestine,

and its colour is due to bile, but the bulk of it is believed to be mainly composed of matter derived from the vernix caseosa which the infant has swallowed during intra-uterine life along with liquor amnii (Zweifel). This is proved by the fact that meconium always contains hairs and squamous epithelial cells, which must have been derived from the surface of the child's body.

After four or, at most, five days the motions cease to contain meconium and assume the characters of normal infantile fæces.

Normal Fæces

In a healthy breast-fed infant the motions are from two to four in number daily during the first month or two, and usually two or sometimes only one daily after that. They are of an orange yellow colour and of a uniform semi-solid consistence. The reaction is acid, and they have a slightly sour but not offensive odour. The stools of a hand-fed infant are similar, provided the food that he is taking resembles breast-milk in composition and is being well digested.

The characters of the motions are readily altered by changes in the feeding. For example, as a considerable proportion of the cream of the milk remains under normal conditions unabsorbed, and acts on the bowel as a natural laxative, a defective amount of fat in the food tends to diminish the number of the motions. An increase in the amount of the casein present usually has a constipating e.

The exact shade of yellow colour in normal milk-fæces depends largely on the percentage of fat in the milk, being paler if the amount of fat is small. The reaction may become alkaline from changes taking place in the incompletely digested proteids. The addition of meat preparations, such as beef tea or raw meat juice, to the diet causes the fæces to acquire an offensive odour.

By the end of the first dentition the motions have assumed a brownish colour, and are usually formed.

Abnormal Fæces

The condition of the motions is frequently of great importance, and information regarding them must always if possible be obtained by personal inspection, as the statements of the mother and nurse on such matters are often misleading. The attention must be directed not only to the number of the motions, but also to their condition as to colour, consistence, reaction, odour, size, and composition. Many abnormalities in the character of the stools will be considered later in dealing with morbid conditions of the intestines, but a few remarks may be made with regard to certain points.

The **Colour** is very frequently altered in disease. A green discoloration of the stools is extremely common, and of itself has little diagnostic significance. The *green colour* is said to be usually due to an alkaline condition of some part of the alimentary canal (E. Pfeiffer), even when the stools themselves are acid in reaction. In some cases, at least, it is due to chromogenic organisms (Lesage). Normal motions frequently turn green soon after they have been passed.

Clay-coloured motions are usually due to a diminution in the amount of bile entering the intestine. They are seen in an extreme degree in obstructive jaundice, but are also met with not infrequently without any jaundice, and sometimes continue for weeks in young children without any severe accompanying symptom.

Whitish motions are sometimes due to the large proportion of undigested milk-curd present. Paleness of the stools is a symptom which readily attracts the mother's attention, and is attributed to "a lack of bile." The child who has such motions will generally seem better after a dose of grey powder and rhubarb, and his motions will have a better

colour for a day or so. It is not desirable, however, to repeat this very often; and what the child needs is not a liver stimulant but general tonic, hygienic and dietetic treatment (see Chronic Intestinal Indigestion).

The administration of bismuth produces a *greenish black colour* in the discharges. Iron also stains them *black*. The darkest stools, however, are those due to the presence of altered blood.

The soft homogeneous **Consistence** of properly digested milk-fæces is lost as the child's food is varied, and is more or less changed in most forms of dyspepsia. The stools are generally much too liquid in diarrhœa and too solid in constipation. Sometimes, as in summer diarrhœa, the motions are composed of almost pure serum; and when this is so for some time, the child's condition is generally serious. There is, as Henoch has pointed out, a form of diarrhœa in infants in which part of the motion passed is tolerably normal in consistence and appearance, but this is accompanied or followed by a large amount of fluid, which may readily be mistaken for urine. This form of diarrhœa is very exhausting.

The **Reaction** is generally more or less acid and sometimes very markedly so. The watery motions of summer diarrhœa, however, are distinctly alkaline.

The **Odour** of the motions is often greatly increased in disease. When acid fermentation is present, they have a sour smell, and often, from decomposition of albuminoid matter, they become extremely putrid and offensive.

The **Size** of the stools is very important. If a very large amount is passed in the day, this indicates a great diminution in the absorption of nourishment from the alimentary canal, and is usually accompanied by a rapid failure of strength. It is met with in cases where the small intestine is much affected. When the motions although frequent are very small in amount—as is the case when the lower bowel is

chiefly involved—the interference with the child's nutrition may be comparatively slight.

The **Composition** of abnormal motions varies greatly in different cases. They may contain not only the remains of the food more or less digested, and also the various other normal constituents of fæces—such as bile, mucus, epithelium and micro-organisms, in altered proportions—but also, in addition, blood, pus, false membrane, internal parasites and their ova, and foreign bodies. They are often frothy from admixture of an abnormal amount of gas. When the stools are too frequent but apparently normal in character, this should suggest the possible presence of ascarides.

In some forms of diarrhœa the food, or certain elements of it, are passed entirely undigested. When fragments of undigested curd are present, this generally means that too much casein is being taken in the meals. In some cases in which the infant is having an excessive amount of cream, little yellowish white particles very like casein are found, which consist of unabsorbed butter. They differ from casein particles in being soluble in equal parts of alcohol and ether. A quantity of fat is found in the stools in some cases of pancreatic disease. When cod liver oil is being taken in too large doses, it may be seen and smelt in the motions. A perplexing appearance of oil in the stools may be met with in a child whose throat is being sprayed with paroleine. When starch is given prematurely, or in too large amount, its presence in the motions may be demonstrated by the use of iodine or by the discovery under the microscope of starch granules.

The **Mucus** which is normally present is very greatly increased in amount in some organic diseases. When its increase is very obvious to the naked eye, it usually indicates irritation of the large intestine. It is a marked symptom of intussusception. Increase in the amount of mucus is not

always, however, a sign of organic disease, but also occurs in such a purely functional disorder as lienteric diarrhœa.

Pus is found in the stools in cases of ulceration of the bowel and also in very severe chronic catarrh.

Blood is passed in the motions under a great variety of conditions, and its presence in small amount is not usually of serious significance. Streaks of blood may often be seen in the stools in various forms of diarrhœa, and often, also, in obstinate constipation, especially if there is any ulceration, fissure, or prolapse of the rectum present. Blood and mucus, sometimes in considerable quantity, and passed alone with straining, are a common feature in intussusception.

Hæmorrhage from the bowel is a frequent occurrence in various hæmorrhagic diseases, such as purpura, hæmophilia, scurvy, and the hæmorrhagic disease of new-born children, also in serious organic diseases of the liver, heart, etc. When blood is passed in considerable amount after defæcation without any other symptoms of disease being present, it is often due, as already said, to a rectal polypus.

Spurious melæna—i.e. the passage from the bowel of blood which has been sucked from fissures in the mother's nipple —is much oftener met with than true melæna; and, at all periods of life, the occurrence of epistaxis is a common cause of blood in the motions.

Fragments of **Membrane** are found in the stools in dysentery; and, in the rare instances in which croupous enteritis occurs in children, the motions may be passed covered by a layer of false membrane, or pieces of it may be seen among them.

Worms and their ova are also to be looked for. Occasionally the larvæ of certain flies are passed repeatedly.

Micro-organisms are, of course, always present in enormous numbers; but their differentiation is not generally practicable in ordinary clinical work. In cases of infantile

diarrhœa, the possibility of infection and re-infection, unless the strictest precautions are taken in handling the napkins, cannot be too strongly impressed on the nurses.

Foreign bodies of various kinds are sometimes found in the motions. When children acquire the habit of eating earth or some other indigestible substance, this is sometimes first discovered by seeing it in the stools. Unabsorbed vegetable fibres may also give rise to a curious appearance in the motions and require the microscope for their recognition.

Signs of Imperfect or Deranged Digestion

DISORDERS OF APPETITE

Diminished Appetite (*Anorexia*).—Refusal of food is always a matter which needs investigation. In young babies it may be due to a painful condition of the mouth or throat or œsophagus. In such cases local treatment is called for. The commonest cause of diminished appetite is dyspepsia. It occurs as the natural accompaniment of diminished power of digesting the food, and with recovery of the digestive power the appetite returns. Obstinate refusal to suck is occasionally the most striking symptom noticed at first in cases of pyloric stenosis before the vomiting becomes marked (p. 129). In rare cases persistent refusal to suck in young infants is due to mental defect, and it may be its earliest manifestation.

In delicate children, with a tendency to tuberculosis, a small appetite is often a great evil, because it interferes greatly with the fattening process which is so much to be desired in them. It is to be dealt with by free open-air treatment, by change of air, and by alkaline or acid tonics. Ichthyol (grs. i or ii, with glycerine and syrup) is sometimes useful, and occasionally tannate of orexin (grs. iii to v) succeeds when other drugs fail.

Anorexia nervosa is not very rare in older children. It usually yields most satisfactorily to Weir-Mitchell treatment.

Increased Appetite (*Bulimia*).—An unnatural craving for food is sometimes a symptom of dyspepsia. In babies it may be merely a bad habit induced by persistent overfeeding. Generally, however, it should be remembered that when an infant shows an inclination to take more than usual, it is because he is thirsty rather than hungry.

Depraved Appetite.—Children who are nervous, anæmic, or mentally deficient, and those who are suffering from worms, are apt at times to show a craving for unsuitable articles of diet (see Pica, p. 348).

The Act of Sucking.—In connection with the question of appetite, we may consider the act of sucking. In the adult there are two ways of drawing liquid into the mouth[1]—

(*a*) *Inspiratory Sucking*, in which the suction power comes from the lungs, the buccal cavity being open behind for the time.

(*b*) *Mouth Sucking*, in which, the buccal cavity being closed behind, the active lowering or flattening of the tongue which forms its floor causes the indrawing of the liquid.

In the new-born child the process is one of mouth-sucking, but it differs somewhat from that in the adult. The infant's tongue, being as yet less mobile and more fixed in its position, as well as relatively larger, plays a less active part; and the lowering of the floor of the mouth is mainly due to vigorous downward movements of the lower jaw. As the child grows older (2 to 4 years), he gradually takes to the adult way of using the tongue in sucking.

For the proper performance of the act of sucking, the lips must be able to close firmly on the nipple, and the pharynx be quite shut off by the soft palate. The upper respiratory passages must also be free, so that breathing may

[1] L. Auerbach, *Arch. f. Anat. und Physiol.* (Physiol. Abth.), 1888, p. 59.

go on with the mouth shut; and there must be no pain. If any of these conditions is not fulfilled, sucking may be greatly interfered with, and nutrition may consequently suffer. When a baby refuses to suck, we should always endeavour to find out whether this is due merely to a disinclination for food, or whether it is caused by some interference with the act of sucking.

Local causes of interference with sucking are found in hare-lip and cleft palate and, rarely, in severe tongue-tie, also in facial palsy and diphtheritic paralysis of the soft palate. Short of actual paralysis, mere debility of the infant from any cause may make him cease sucking. It is then necessary to feed him with a spoon or syringe. The baby may also refuse the breast or bottle if he has recent nasal obstruction, and also if he has dyspnœa from pneumonia. In either of these cases, he has difficulty in keeping the mouth closed long enough for the purposes of sucking. Any painful condition of the lips, tongue, or palate may stop a child's sucking. Pain in the act of swallowing will often have the same effect.

Difficulty in swallowing Solids.—This is met with in a marked form in the very rare condition of spasmodic stricture of the œsophagus. It is, however, not at all uncommon to find a considerable degree of the same difficulty in young babies who are being given food for the first time. It seems to be a sort of nervous trick, and is generally soon got over by means of gentle perseverance on the part of the nurse.

Thirst.—Excessive thirst is, of course, characteristic of diabetes and polyuria, and, in a varying degree, of all feverish conditions. It is, however, oftenest met with in cases of severe diarrhœa and vomiting. We see the baby opening and shutting his parched mouth and straining wistfully after any bottle or cup that is brought near him. Such signs of thirst form an urgent indication for treatment, and boiled

water, not milk, is to be given. If, for any reason, fluids cannot be given by the mouth, saline enemata (2 oz.) should be tried. If these are not retained, it may perhaps be advisable in special cases to give subcutaneous saline infusions.

Flatulence and Colic

These symptoms frequently occur together. They may be present when there is neither vomiting nor diarrhœa, although often associated with these symptoms.

Causes.—*Gastric flatulence* may arise from fermentation of the food in the stomach, but it is frequently due to the infant's sucking air from the empty mouthpiece of a feeding-bottle or swallowing it along with his milk. It is often noticed when the baby takes the bottle too greedily.

Flatulence in the bowel arises from decomposition of its contents with the formation of gas. It is apt to be set up when there is too much indigestible matter—such as starch, or milk curd, or fruit—in the food.

Colic may be due to the presence of wind or of irritating substances arising from chemical decomposition, to the mechanical irritation of scybala, or, rarely, to lead-poisoning. It is often complained of in cases of chronic constipation. It may also be caused reflexly—*e.g.* by cold feet.

Extremely severe recurrent colic occurs in cases where there is a chronic organic obstruction of the lumen of the bowel. This is most frequently due to tuberculous ulceration or adhesion. When any condition of the kind is suspected, the abdomen should be carefully watched for the occurrence of "ladder patterns" (p. 83).

Diagnosis.—The presence of colic is easily recognised by noting the child's behaviour when an attack comes on. The pain makes him cry, and during the paroxysms of crying he flexes the legs on the thighs and the thighs on the abdomen, bending up the arms also and clenching the fists. After this

has lasted a short time, some wind may pass, and the pain is at once relieved, although it will probably soon recur.

There is generally no difficulty in recognising the seat of the pain in a case of ordinary colic, but renal colic is sometimes mistaken for it. Long-continued or frequently recurring abdominal pains, however, are sometimes caused by spinal caries, and these are not infrequently mistaken by the parents for colic.

Treatment.—When the *flatulence* is due to the swallowing of air along with the food, a change in the method of its administration may diminish or stop it. A sick infant who is being fed out of a small spoon, and is gulping down air each time, will swallow less wind if a large spoon is used, and probably none at all if he is skilfully fed from a bottle or with a syringe and tube (Chap. XXV.). If the air is swallowed during the process of sucking from a bottle, care should be taken that the rubber teat is full of milk when the child sucks it.

If the flatulence is due to fermentation, its treatment is mainly prophylactic, *i.e.* regulation of the digestibility and quantity of the food and of the way in which it is taken. Alkalies with a carminative (F. 3) or with pepsin or papain (F. 4) are also sometimes useful.

The best immediate treatment of an attack of *colic* consists in irrigating the lower bowel with a large quantity of warm water, or administering a copious warm enema. The application of hot fomentations to the abdomen and of warmth to the feet are also serviceable, and twenty drops of whisky or a dose of carminative may help to relieve the child. A dose of calomel is usually indicated to clear away irritating matters; and if the bowels are habitually constipated, this should be attended to.

In cases where there is obstinate recurring colic, small doses of codeine ($\frac{1}{3^{\frac{1}{2}}}$ to $\frac{1}{2^{\frac{1}{4}}}$ of a grain) are occasionally useful

as a temporary palliative while the diet is being gradually regulated. The alleviation thus produced encourages the mother to persevere. Older children who have chronic indigestion accompanied by recurrent colic are often relieved by small doses of Fowler's solution (♏ i) taken immediately before meals.

Vomiting

Vomiting occurs more frequently and more easily in children than in adults. It is by no means always a sign of disease of the stomach, and it is often met with under other conditions.

Causes.—1. In *acute febrile and infective diseases* vomiting is often one of the first symptoms noticed. This is so in pneumonia and also in scarlet fever and some of the other exanthemata. It is a frequent symptom also in some epidemics of influenza, in uræmia, and other renal affections, and in so-called "cyclic vomiting."

2. In *meningitis* and other *cerebral affections* it is an important symptom, and whenever we have obstinate and unexplained vomiting, we should remember the possibility of its being cerebral. It may be impossible to discriminate cerebral from dyspeptic vomiting in infants by any special characters, the relation to food affording little help in their case owing to the frequency of their feeding.

3. *Intestinal obstruction* from intussusception, peritonitis, or other local disease must always be borne in mind as a possible cause of vomiting.

4. *Reflex vomiting* is occasionally met with. It may be due to irritation in connection with worms, or teething, or the ears.

5. In older children, especially girls, there is sometimes *hysterical vomiting* without any local disease.

6. Vomiting is a very important symptom of cardiac dilatation and failure, and is especially to be watched for in diphtheria (p. 240).

7. In most cases of congenital hypertrophy of the pylorus, vomiting is the most striking symptom (p. 125).

8. A sort of vomiting sometimes occurs apart from stomach disease in cases where there is *severe coughing*, the food being brought up by the violence of the cough. This occurs chiefly in whooping-cough.

9. Generally, however, vomiting is due to *local irritation of the stomach*. You may find a simple regurgitation of milk occurring soon after nursing owing to the infant having taken too much, the stomach gently rejecting the surplus which would otherwise interfere with digestion. This is met with in strong and healthy infants on the breast. The milk comes up with no effort or discomfort and runs out of the corners of the mouth. If the child is thriving no special treatment is necessary, but his meal may be shortened and he should be kept quiet after it.

Dyspeptic vomiting differs from this condition in being accompanied by more or less retching and discomfort, and in the fact that the contents of the stomach are expelled with some force. It occurs also after small quantities of milk.

Diarrhœa

Diarrhœa is a symptom of the greatest importance in childhood, because of the number of deaths which it causes and the amount of ill-health to which it gives rise. The term is a vague one, for it may be applied to any case where the motions are too many, or too large, or too loose—even when normal in number.

Causes.—Diarrhœa is, as might be expected, characteristic of various totally different conditions; for example—

1. It may be due, like vomiting, to some *general poison* like that of scarlet fever, measles, pneumonia, septicæmia, or uræmia.

2. It is often merely *reflex or functional*, and no more

organic in origin than sea-sickness. Thus it may arise from a sudden chill or wet feet, or from emotional causes, or even, possibly, from the reflex irritation of teething. Lienteric diarrhœa also belongs to this class.

3. It may be a symptom of *organic disease of the intestine* such as ulceration, waxy disease, or catarrh.

4. Most frequently, however, it is due to *local irritation of the bowel* by its contents, and it represents nature's attempt to get rid of what is really or virtually a foreign body. Thus it is often the result of indigestible or at least undigested food, or of worms or other foreign bodies, and in a large proportion of cases it is kept up by poisons produced by the local action of germs in the alimentary canal, even when it has begun from other causes.

The treatment of vomiting and diarrhœa must depend on their cause, and will be considered along with that of the conditions which most frequently give rise to them.

Constipation

Causes.—Insufficient or infrequent evacuation of the bowels short of obstruction may be due to various dietetic and other causes. Sometimes, for instance, it is a symptom of *cerebral disease*, of *congenital hypertrophy of the colon* (p. 159), or of some *malformation of the bowel*. Occasionally it may depend on the presence of a *fissure or ulcer at the anus*, which causes the child so much pain that he instinctively restrains the action of his bowels as long as possible. These cases are not very uncommon, and they are important because of the special treatment which they require (p. 90).

In most cases constipation is probably connected with *diminished intestinal or biliary secretions* and an excessive secretion of mucus, or else with *want of tone in the lower bowel* and in the muscles concerned in the act of defæcation.

In little children, the general flabbiness of rickets is a frequent etiological factor.

There are usually also *dietetic causes* in operation. If the child is on the breast or bottle, the constipation is often due to a deficiency of cream or an excess of casein in the milk. Infants nursed by mothers who are constipated are often similarly affected. In older children the constipation may be due, as in adults, to the foods given being too completely digestible; occasionally, however, such things as porridge and fruit given in large quantities for laxative purposes, if they interfere much with the digestion, seem to increase constipation instead of relieving it. In older children, especially girls, obstinate constipation is apt to accompany symptoms of mental depression. In such cases it disappears as the mental symptoms are recovered from, and a course of Weir-Mitchell treatment is often most successful in relieving it.

Treatment.—In the case of nursing infants, treatment of the mother's constipation may benefit the child. If there is a *local cause*, it must be attended to. Measures should also be taken to *improve the general tone*. If rickets is present, it should be treated, and in older children cold douching and regular exercise are often useful.

Massage of the abdomen, if properly applied in the direction of the colon, is often very efficacious. It may be done two or three times daily for ten minutes at a time, most attention being given to the region of the sigmoid flexure. Gymnastic exercises in which the abdominal muscles participate are also very useful.

It is always important that the baby should get into the *habit* of expecting to have his bowels moved regularly at a certain time of day. Even young infants may be taught, if they are always placed on the chamber at the same hour; and it is better that this should be done just after a meal.

A *soap or glycerine suppository* is frequently useful in helping to establish regular habits. Small *enemata* of glycerine and water may also be used, but copious injections should be avoided, as tending to distend and further relax the lower bowel.

The *diet* must be carefully attended to. In babies an increase of cream or of sugar is often sufficient, or the addition of barley water or oatmeal water to the milk. In others, what is most required is the modification of the milk so as to lessen the proportion of curd in it. Sometimes one of the malted foods (*e.g.* Mellin's) is useful. For older children, porridge, fruit, and vegetables are usually indicated. Fruit is especially efficacious if given before breakfast, and a roasted apple at this time will, in the case of some children, render laxative medicine unnecessary. Indigestible articles and an excess of farinaceous food are to be avoided. Cream and cod liver oil are often laxative in their effects, and extract of malt may be successful in the same way.

Medicine should be used as little as possible in the treatment of constipation, but in certain forms of the condition some drugs are of considerable value. One of the most useful for infants and young children is magnesia. The best form is the powder, of which 5 to 10 grs. may be given two or three times a day, to begin with. If this amount proves insufficient, it should be steadily increased until the motions become sufficiently soft to pass easily (Cheadle). Magnesia, given in the same way, is also often useful in older children. Phosphate of soda has a similar action to magnesia, and may be given in the same doses.

Tincture of podophyllin is often useful in obstinate constipation in babies with dry white stools. It should be given in doses of three minims, two or three times a day,

and one minim can be added to the dose every second day until the action of the bowels is satisfactory.

Compound liquorice powder and cascara sagrada, in some of its less bitter preparations, are suitable and useful laxatives for older children, and a short course of mineral waters is sometimes of benefit.

CHAPTER VI

ON CERTAIN DISEASES OF THE DIGESTIVE SYSTEM—I

Food Atrophy

Atrophy, wasting, or marasmus is a state of malnutrition characterised by more or less extreme emaciation, with lowering of the vital powers and consequent interference with all the functions of the body. It is practically a chronic starvation of all the tissues, and it may occur under a variety of conditions. It may be due to *congenital syphilis* or *tuberculosis*, and in fact there are few serious and prolonged diseases in which it does not occur.

By far the most important, because the commonest, form of wasting, however, is food atrophy, or athrepsia, as M. Parrot called it.

Causes.—Food atrophy may be due to simple *starvation*, intentional or unintentional, the child not being able to be properly fed for some reason, or the food given either not containing enough nourishment for him to thrive on or containing it in such an indigestible form that he is unable to assimilate it.

In the great majority of cases, however, it is to be regarded as merely a symptom of *impaired digestion and assimilation*. Sometimes it is obviously the result of vomiting and diarrhœa; but often the wasting itself is the most marked, if not the only, indication that the digestive organs

are failing to appropriate normally to the child's use the nourishment contained in his dietary.

Although the food factors in the causation of this form of atrophy are the most obvious, there are also others which are very important. The chief of these are *congenital debility* (due often to anæmia and weakness of the mother during pregnancy) and *unfavourable hygienic conditions* such as damp foul air and absence of sunshine. When such predisposing causes exist, a much smaller error of diet will be sufficient to induce atrophy than would be required under ordinary circumstances.

Symptoms.—The symptoms vary according to the stage of the case. The first thing noticed is that the child is not gaining weight, and it is soon found that he is actually losing. The loss may not at first be apparent, unless he is regularly weighed, but soon it is only too evident. The baby becomes emaciated and pale, his features are sharp and thin instead of being rounded and chubby (Fig. 48), and the fontanelle is depressed below the level of the surrounding bones. The muscles are small, weak, and flabby. The skin is loose and lies in folds on the limbs. When you pinch it up lightly between your finger and thumb, it is inelastic and remains unnaturally in the folds in which you put it. Its surface is often dry and harsh from branny desquamation of the epidermis. The temperature is low, often much lower than normal—reaching sometimes below the range of an ordinary clinical thermometer, and in severe cases even below 90° F. The extremities are usually slightly cyanosed.

Fig. 48.—Food Atrophy. Boy aged 7 weeks.

There is also, generally, more or less vomiting with

irregularity of the action of the bowels—sometimes constipation, but often diarrhœa. The child is extremely peevish, and cries passionately; sometimes he takes the bottle ravenously, sometimes he is listless and apathetic. There is often thrush in the mouth, and frequently there are patches of erythema and excoriations in the groins and about the anus and genitals. There is also a tendency to the formation of boils and subcutaneous abscesses.

Diagnosis.—The presence of atrophy is easily recognised, but it is sometimes difficult, at first, to be sure whether a case is one of food atrophy, or whether there is not some constitutional disease present that accounts for the wasting. In examining a case, congenital syphilis and tuberculosis should always be borne in mind, besides local diseases such as empyema, which may occur even in the first few weeks of life.

If syphilis is present, there will generally be something suggestive in the history of former children, if not in that of the mother; or the patient may have some snuffling breathing or a hoarse cry, or traces of some characteristic skin eruption about the anus, on the eyebrows, or elsewhere.

Tuberculosis is more difficult to make sure of. If the family history is bad, or if there are indications of consolidation of the lungs, these are points in its favour; but it is well to remember that a great many children are put down as tuberculous who turn out to be merely suffering from the results of injudicious feeding.

Careful watching of the progress of the case and of the effect of treatment will generally decide the matter.

Prognosis.—The result of treatment depends on the stage at which it has begun and on the possibility of improving the patient's conditions. In severe cases, the

prognosis should be very guarded. In these children, the subjective symptoms are slight, and this is apt to lead to the danger being underestimated.

Termination.—When the case is not taken in time, the child gets weaker and weaker, and dies from some complication which would probably have done no harm to a healthy infant. For example, a slight chill may lead to bronchitis, passing on rapidly to pulmonary collapse and pneumonia; or an aggravation of the vomiting or diarrhœa may prove speedily fatal. If vomiting is present, there is a constant risk of regurgitated fluid being drawn into the air passages and giving rise to suffocation or to "inhalation pneumonia."

Not infrequently, wasted babies die suddenly, without having shown signs of any distress, and, on post-mortem examination, it appears that death has been due to embarrassment of the respiration and circulation by an extreme distention of the stomach with wind. Whether this is due to decomposition of the food in the stomach or to the infant's having swallowed air may be difficult to decide.

Treatment.—The treatment of atrophy consists mainly in giving the child the most nourishing diet that he is able thoroughly to digest. There is nothing so likely to succeed as breast-milk, and many infants, who would certainly otherwise have died, are saved by wet-nurses. When a wet-nurse cannot be employed, as is of course frequently the case, something as nearly as possible equivalent to human milk must be provided. In moderately severe cases simply modified milk may suit quite well, and babies who cannot digest this may be able to take some form of peptonised milk with advantage.

The food must be given with the utmost regularity, great care being taken that the child does not drink too rapidly or too much at a time. In some cases it may be necessary

to use forced feeding because the infants are unable to suck, and may not even be able to swallow properly. Often five or ten drops of whisky well diluted may, with advantage, be given before each bottle. The inunction of neat's foot or cod liver oil is often recommended, and seems sometimes to be useful.

Attention has recently been called [1] to the great advantage which often results in wasted babies from the regular use of rectal injections of three-quarter per cent. saline solution. I have seen marked improvement follow such injections in several cases. From 4 to 7 drachms of the solution may be given at a time. It should be used at the temperature of the body, and should be allowed to flow into the rectum very slowly through a catheter. Some babies cannot be got to retain the injections at all. When this is so, the subcutaneous injection of saline solution may sometimes be beneficial.

Dr. J. W. Simpson has suggested [2] the administration of small doses of thyroid substance ($\frac{1}{3}$ to $\frac{1}{2}$ gr. of Burroughs & Wellcome's tabloids twice or thrice daily) to wasted infants. This treatment certainly deserves a trial. I have seen a number of cases in which it was at once followed by a striking gain in weight and vigour.

The hygienic surroundings of the child must be seen to: draughts and exposure guarded against, and the room kept carefully heated. In bad cases it is well to keep the child in an incubator, or at least wrapped up in cotton-wool and surrounded by hot bottles.

When there is *irritation of the skin* about the anus or elsewhere, the parts should be smeared with zinc ointment.

[1] Louis J. M. J. Pery, "De la débilité, congénitale et acquise, des nouveau-nés," *Thèse de Bordeaux*, 1903.

[2] "The Thyroid Gland in relation to Marasmus," *Scot. Med. and Surg. Journ.* xix., Dec. 1906, p. 504.

Boils are due to infection with pus-producing organisms. They should be opened early, the surrounding skin being first carefully cleansed with corrosive solution (1 to 1000), and an antiseptic dressing applied.

Acute Indigestion

Causes.—This condition is generally due to the child having swallowed something which is so unsuitable as food as to give rise to local irritation in the bowel or stomach, or both. In infants, *over-feeding* is a common cause of indigestion. The child may get the bottle too often or too much at a time (perhaps to quench thirst), or the milk may be *too little diluted*, or other things may be given along with or instead of it which are *not fully digested*, and therefore cause irritation in their passage downwards. *Sour milk* or milk which is *tainted with some impurity* is probably the most frequent cause.

In older children, *foreign bodies*, and *undigested articles* which act as such, are often to blame. Currants and raisins, raw fruit and vegetables, hard and unchewed fragments of potato and meat, are examples of this. We must also remember that indigestion may be caused by *drugs* such as cough mixtures, iron preparations, etc.

There are, however, other elements in the causation besides the nature of the food. The child may be so *delicate* and prone to *catarrh* that even carefully chosen food sets up irritation. *Teething* has certainly in some cases an influence in so disturbing the nervous system that, while it is proceeding, causes set up diarrhœa and vomiting which at other times would be unable to do so. A *chill* from insufficient clothing, and sitting on cold and damp seats, is a frequent and important cause.

Symptoms.—Indigestion gives rise at first to restlessness, languor, discomfort, and flatulence, and these are apt to be

soon followed by vomiting, and later by colic and diarrhœa. At the beginning the motions are normal, later they become loose and watery. In infants they tend to assume a green colour. There is usually considerable relief for a time after a motion until the pains begin again. After the first few motions, however, there is not usually much pain. The temperature may be up at first, but rarely continues high after the first few hours. Emaciation takes place rapidly.

If the cause ceases, the symptoms generally subside in two or three days; but if it continues to act, they go on indefinitely. If the case lasts long and is severe, the vomited matter and motions become slimy from the presence of an excess of mucus, and this suggests the presence of catarrh.

Treatment.—If there is reason to suspect that the child has recently had an indigestible meal, an emetic should be given or the stomach washed out. This may often cut short the attack. In most cases, unless the diarrhœa has already been severe, it is well to assist nature to get rid of the irritating matter by giving an aperient such as a teaspoonful of castor oil or syrup of rhubarb.

In an infant, if the case is a severe one, the most important thing to do is to *stop all milk for many hours* (twelve to twenty-four), giving only an unirritating fluid such as barley water, or white of egg and water (Appendix F), or plain sterilised water in small quantities every hour or so during this time. In older children, a similar line of treatment is to be followed; but the patient may often, with advantage, be allowed boiled milk diluted with barley water or potash water.

For *medicinal treatment*, small doses of grey powder with soda and bismuth (F. 5) may be given every two hours, or a bismuth and soda mixture (F. 6). Small doses of castor oil are also very efficacious (F. 7). If the diarrhœa persists, small doses of laudanum may be added.

It is important to guard against relapse by a very careful *regulation of the diet* for some time after an attack, even if obvious indiscretion has been the cause of it. When anything in the habits or dieting has led to the attack, this must of course be seen to at once.

Chronic Vomiting

Causation.—When long-continued and severe, vomiting generally indicates the presence of gastric catarrh, in which there is an excess of mucus secreted and too little gastric juice. At the post-mortem in such cases, there is usually little organic change to be found. The vomiting is often due to unsuitable food, such as sour milk, or to too large quantities of food, or to the meals being given at too short intervals.

Symptoms.—Along with the persistent vomiting there may be constipation or purging, and the child's general nutrition suffers in the same way as in diarrhœa.

Diagnosis.—In investigating the causation of obstinate vomiting in children, the possibility of its being cerebral must always be borne in mind, and special attention given to ascertain the previous state of the digestion, the present state of the pulse, and whether any other symptoms of cerebral disease are to be found. When persistent vomiting occurs in new-born children without intestinal obstruction, it may be due to some abnormality in the breast-milk, to congenital hypertrophy of the pylorus, or to acid dyspepsia.

Treatment.—The first indications in a case of chronic vomiting are to *rest the stomach* and *regulate the diet.* The intervals between the meals may have to be lengthened, and the details of the feeding must be carefully attended to. In young babies, nothing succeeds so well as a wet-nurse. In hand-fed infants, the milk should be discontinued for a time, and raw meat juice and barley water, or white of egg and water, given in its place. Occasionally peptonised milk is

helpful, and Mellin's food and some of the farinaceous foods may be temporarily useful.

Washing out the stomach is almost invariably beneficial, especially in the case of young babies. It is more difficult and therefore less satisfactory in older children. The great advantage of gavage in severe cases will be referred to later (Chap. XXV.). The most generally beneficial medicine for these cases is bismuth with or without an alkali (F. 6 and 8), and drop doses of Fowler's solution or of ipecacuanha wine, immediately before each meal, are useful in many cases. Dilute hydrochloric acid, nux vomica, and creasote (F. 9) are all occasionally of value, in small doses.

Recurrent Vomiting (*Cyclic Vomiting*)

This name is given to a condition in which there are recurrent attacks of severe vomiting taking place at intervals, sometimes of weeks and sometimes of many months, with no obvious dietetic or other cause to account for them.

Clinical Features.—The attacks often begin when the child is between two and five years old, but they may occur first in early infancy. They go on recurring for years. The patients are sometimes delicate and sometimes otherwise healthy children. The disease is commoner in private than in hospital practice, and seems to occur specially in the children of gouty and neurotic parents.

The actual attack is sometimes preceded by a feeling of languor, drowsiness, loss of appetite, and general malaise. After this has lasted for from twelve to twenty-four hours, or sometimes without any preliminary symptoms, the vomiting begins. It is generally severe and distressing, and goes on at short intervals for from one to five days or longer; and it is apparently uninfluenced by the usual treatment of dyspeptic vomiting. The temperature is often raised at first, but not usually above 100°. There is complaint of thirst and head-

ache; and there may be some vague abdominal pain, but there is no well-defined tenderness. The child looks very ill, and is drowsy, with a dry, furred tongue, and a weak, rapid pulse. The abdomen is not distended, and may be flattened; there is usually constipation. The vomiting generally ceases about the third day, and the convalescence is fairly rapid. The vomited matter consists of food and mucus and bile, and there is often also a little blood in it. The urine may contain some albumin and blood, and hyaline casts. Acetone is frequently, if not always, to be detected in the breath and in the urine at some stage of the attack.

The **causation** of the disease is still quite obscure. The attacks are in many ways comparable to those of migraine in later life, and probably many, if not all, of them may be regarded as of lithæmic origin (Rachford, Holt). There is, however, considerable difference of opinion on the matter.[1]

Prognosis.—This is generally good, so far as the individual attack is concerned. Occasionally, but very rarely, the patient dies in the attack. There is great probability of the attacks recurring at varying intervals for years; but there seems to be a tendency to spontaneous recovery occurring about the time of puberty. In some cases the vomiting attacks pass into migraine.

Diagnosis.—A first attack is apt to be mistaken for one of meningitis, of acute gastric catarrh, of appendicitis, or of intussusception. Attention to the history of the case and to the symptoms should generally, however, exclude these conditions. The disease which most closely resembles recurrent vomiting is probably gastric influenza, and the presence of

[1] Crozer Griffith, *Amer. Journ. of Med. Sci.* cxx., Nov. 1900, p. 553; Marfan, *Arch. de Méd. des Enfants*, vol. iv., 1901, p. 641; Edsall, *Amer. Journ. of Med. Sci.* cxxv., April 1903, p. 629; Rachford, *Neurotic Disorders of Childhood*, New York, 1905, p. 217; H. Batty Shaw and R. H. Tribe, *Brit. Med. Journ.*, Feb. 1905, p. 347; F. Langmead, *ibid.* p. 350.

other cases of influenza in the family or neighbourhood should also therefore be inquired into.

Treatment.—When an attack threatens, the patient must be kept quiet in bed, and the lower bowel should be emptied by an enema. In many cases marked improvement follows the administration of bicarbonate of soda in large quantities (120 to 180 grs. in the day).

So long as the violent vomiting continues, no food should be given by the mouth, and usually all liquids have to be withheld. Sometimes, however, after the attack has lasted for a while, the administration of a large drink of warm water, which is immediately vomited, seems to have a soothing and settling effect.

Saline enemata are generally of great advantage in relieving the distressing thirst from which the patient suffers, and in maintaining the action of the kidneys.

On Congenital Spastic Hypertrophy of the Pylorus (*Congenital Gastric Spasm, Hypertrophic Stenosis of the Pylorus*)

Few morbid conditions of infancy have aroused so much attention during recent times as hypertrophy of the pylorus, and few present more features of clinical and pathological interest. A dozen years ago it was merely a pathological curiosity, and no case of the kind was known to have ever recovered. Now, it is recognised as one of the diseases which any medical man in large practice may expect to meet with some time or other,[1] and which he ought to be able, in most cases, easily to recognise. It has also passed out of the ranks of incurable disorders, and is often treated with complete and permanent success. Much has been learned about

[1] Since 1894 I have had forty-one cases of this disease in my hospital and private practice. Twenty-four of these I have examined post-mortem; in nine of the others I saw the pylorus during an operation. Of the remaining eight, three died without operation and no post-mortem examination was allowed, four recovered without operation, and one is still under treatment.

it, but a great deal still remains to be found out; and it is certain that even a small advance on our present knowledge may, quite probably, furnish us with easier, safer, and surer ways of treatment than we yet possess.

Pathology.—The main points in the pathology of this condition may be indicated in a very few words. The only really important *anatomical* change found is a great muscular hypertrophy of the pylorus and stomach wall, and usually also of the œsophagus. The essential *functional* abnormalities are equally simple. They consist in (1) unduly prolonged closure of the pyloric canal, and (2) unusually forcible contractions of the stomach. There is none of the main symptoms characteristic of these cases which may not be regarded as resulting more or less directly from the excessive ill-timed spastic contraction of the hypertrophied muscular apparatus.

The question whether the muscular hypertrophy present is secondary to the functional over-exertion, or whether it is a purely primary hyperplasia, cannot, perhaps, as yet be said to be finally settled. The three main views regarding the relation between the structural change and the functional abnormalities may be summarised as follows:—

1. According to Hirschsprung's view,[1] which is held by Cautley and Dent, Ibrahim and others, there is real organic stenosis as well as great muscular hypertrophy, and the latter is primary in origin and not the result of antecedent overaction.

2. Pfaundler[2] maintains that there is no real muscular hypertrophy and no organic stenosis, and that the appearance of thickening as well as the obstruction are due solely to spasm of normally developed muscle.

[1] *Jahrb. f. Kinderheilk.*, 1888, Bd. 28, p. 61.
[2] *Wiener klin. Wochenschr.*, 1898, Nr. 45, 52, p. 1025.

3. According to the view of the present writer,[1] there is no doubt about the great hypertrophy of muscle; and this is to be regarded as certainly the result of antecedent overwork. This overwork is connected with nervous inco-ordination; but whether it can have arisen merely from defective development of the nervous apparatus, or whether it is due to some morbid change in the secretions in the duodenum or elsewhere, is still unknown. In the normal stomach the relaxation of the contracted pylorus to let food through, or its continued contraction to keep it back, occurs at the bidding, so to speak, of the intestine. It seems more than likely that some functional abnormality in the bowel may be at the bottom of the ill-timed pyloric spasm. There is nothing in the anatomical condition of the parts to indicate that the obstruction of the pyloric lumen is ever due to anything except the tonic contraction of the greatly hypertrophied muscle and the puckering of the mucous coat to which this gives rise.

There is, I think, strong reason to believe, from the clinical and pathological facts, that a very large amount of the muscular hypertrophy present has taken place after birth. Nevertheless, it seems probable that the functional abnormality on which this overgrowth depends began when the first pyloric movements took place *in utero*. We are therefore justified in still retaining the term "congenital" in the name of the disease. (See also Heubner,[2] Cunningham,[3] and Wernstedt.[4])

Symptoms.—In a typical case the symptoms are fairly characteristic. The patient is a baby of a few weeks old, a

[1] *Edin. Hosp. Rep.* vol. iv., 1896, p. 116; *Scot. Med. and Surg. Journ.* xx., June 1897, p. 511.

[2] "Ueber Pylorospasmus," *Therapie der Gegenwart*, Oct. 1906.

[3] *Trans. Roy. Soc. Edin.* vol. xlv. pt. 1, No. 2, 1906, p. 23.

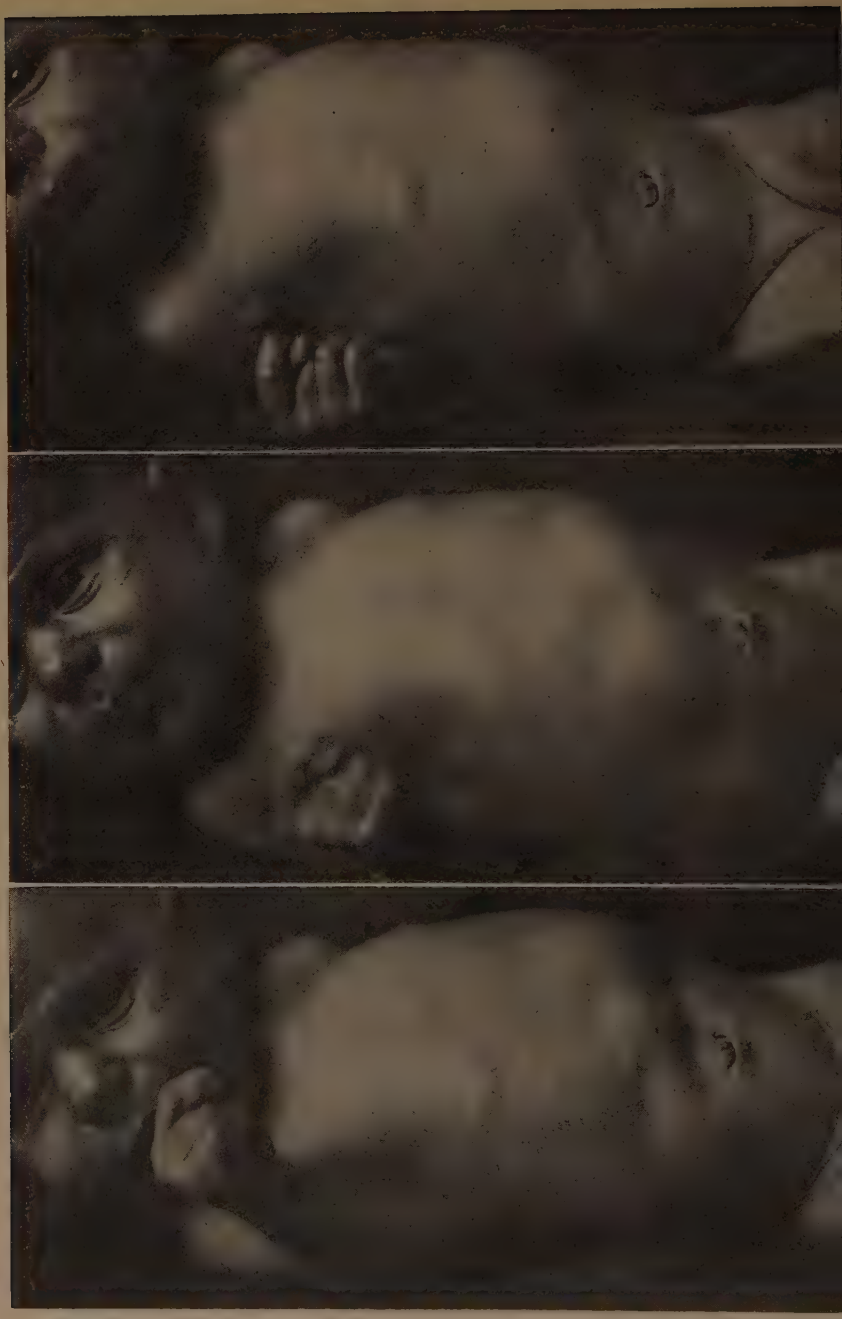
[4] *Nord. Med. Arkiv*, 1906, Afd. ii. No. 2; *Jahrb. f. Kinderheilk.* lxv., 1907, p. 674.

boy in three cases out of every four, and he comes of normal or sometimes of distinctly nervous parents. He has usually been born, at the full time, after a normal pregnancy and a normal labour. I have known at least three instances in which two children in a family were affected.

The complaints with which the child is brought to you are the very ordinary ones of *vomiting* and *wasting*, but you will note that there has rarely been any dietetic error adequate to account for the onset of the trouble. Most of the patients have been either breast-fed or else carefully fed on the bottle. If changes have been made in the character of the food, after the vomiting began, it will probably have been noticed that no improvement lasted for more than a day or two. The only change, if any, which has done good, will probably have been in the direction of lessening the bulk of the fluid taken.

Occasionally the symptoms have existed in some degree since birth; but usually they have only begun after a week or two, or after several weeks, of apparently perfect health. The character of the vomiting, when it has lasted for any time, is generally peculiar. It is forcible and explosive; and the mother reports that the milk shoots out on to the floor through the mouth and nose. The vomited matter is often large in amount, representing more than one meal. It is noticeable, also, that apart from the vomiting there has usually been a striking absence of many of the ordinary signs of dyspepsia. The tongue has kept clean, and there have been no sour eructations, no bile in the vomit, no flatulent distension of the bowels, and no diarrhœa. Often, though not always, there has been obstinate constipation. When the vomiting is severe, the motions are noticeably scanty and usually dark in colour, and the urine is also very scanty.

Along with the vomiting there is generally steady wasting, and the amount of this is of extreme importance. It is so



Figs. 49–51.—Boy aged 8 weeks; Gastro-enterostomy, by Mr. Stiles; recovery. (Photographs by Dr. T. D. Hamilton.)

Exaggerated Gastric Peristalsis in Congenital Pyloric Hypertrophy.

FIGS. 52–54.—Boy aged 8 weeks; Gastro-enterostomy, by Mr. Stiles; recovery. (Photographs by Dr. T. D. Hamilton.)

EXAGGERATED GASTRIC PERISTALSIS IN CONGENITAL PYLORIC HYPERTROPHY.

because it helps to indicate the degree to which the contracted pylorus is preventing the passage of food into the bowel, and consequently the degree of urgency of the case. Although the child is very thin, however, he has not the prostrate, drowsy, poisoned look of ordinary dyspepsia. He just seems eager, pained, and exceedingly hungry. The abdomen is sometimes spoken of as pear-shaped. Over the stomach region it is distended, often so much that the recti show distinct separation there; while the lower part of the abdomen is small and normal in appearance.

The occurrence during the first weeks of life of such a group of symptoms as is described above should always suggest the possible presence of this disease. They make its presence, indeed, quite probable, but they do not prove it. A positive diagnosis should *never* be made unless typical exaggerated visible peristalsis of the stomach is seen. It is well also, if possible, to feel the tumour caused by the enlarged pylorus and to investigate whether the food, when it is not vomited, is retained for an abnormal time in the stomach.

Far the most characteristic and important physical sign of this condition is the *visible exaggerated gastric peristalsis* represented in Figs. 49 to 54. The outline of the stomach stands out and forcible movements pass over it from left to right. In its most marked degree a rounded swelling, sometimes almost the size of a golf ball, rises up slowly in the left hypochondrium and rolls to the right across the abdomen. By the time it reaches the umbilicus another is seen following it; and, if the stomach is much dilated, a third may be showing under the left costal margin before the first has disappeared. While this visible peristalsis is going on, the child may show signs of cramp-like pain; often, however, there seems to be no pain at all. Visible peristalsis may be absent for many hours at a time, but it will be seen, sooner

or later, in all cases that are carefully watched. The best time to look for it is shortly after the child has had a drink. Handling the stomach through the abdominal wall seems sometimes to set it up. In order to be characteristic, this peristalsis must be very marked indeed (see p. 84).

In many cases the enlarged and *hard pylorus* can be distinctly *felt* on palpation. It may even be noticed to alternately harden and relax under the finger. When the organ is quite relaxed it is doubtful whether it is always palpable, and sometimes it is displaced so far backwards under the liver that it cannot, for the time, be made out.

Another important symptom of this disease is the prolonged *retention of food* in the stomach. This is readily demonstrated by the use of the stomach tube. If we empty the stomach and then put into it a measured quantity of food—*e.g.* 2 oz. of diluted peptonised milk—we often find that on passing the tube again, two, three, or even four hours later, the same quantity can be removed. The normal stomach at this age should, after such a meal, have been quite empty within an hour and a half.

Washing out the stomach is often instructive. The forcible way in which the water is pumped up the tube indicates clearly that the stomach wall is hypertrophied. Another point which washing out demonstrates is that the contents of the dilated stomach include a very large proportion of curd—an amount which evidently represents the solid residue of a number of meals.

There is a very disappointing and perplexing variety of the disease, in which the vomiting and the abnormal retention of food in the stomach yield rapidly to simple treatment, but yet the wasting goes on steadily in spite of everything that is done, and the child dies of inanition or perhaps of diarrhœa.

In cases in which the treatment does not succeed in relieving the pyloric spasm, it continues or increases, but the

muscular strength of the stomach wall fails after a time. The child is then no longer able to relieve himself by vomiting, the stomach becomes greatly over-distended, and more or less severe catarrh occurs.

Towards the end, in untreated and unsuccessfully treated cases, drowsiness, nausea, convulsions, and other signs of gastric toxæmia set in.

Diagnosis.—The clinical features above described are generally so distinct that they are not easily overlooked by anyone who is acquainted with the disease. The cases which are most apt to be mistaken for pyloric hypertrophy at first are those of ordinary dyspepsia with pyloric spasm in young babies. These are quite common. The history of the symptoms in them may sometimes be indistinguishable from that in the real cases of pyloric hypertrophy. In the dyspeptic cases, however, we never find exaggerated visible peristalsis, and there is no pyloric tumour and no prolonged retention of food in the stomach. The favourable result of treatment, especially that of dieting and stomach-washing, usually corroborates the diagnosis.

The cases of pyloric hypertrophy which are most apt to be overlooked in the earlier stages by those who are not familiar with the disease, are those in which there is little vomiting. As has already been pointed out, the primary and essential clinical fact is the unduly prolonged closure of the pyloric orifice. The vomiting is merely a secondary matter, and varies in degree with the amount of the food taken. We sometimes, therefore, meet with cases in which the mothers at first lay great stress on the child's disinclination for all food, and say little (or even nothing) about his vomiting. The nature of such cases is sometimes altogether overlooked in the early stages—till, indeed, the child's distaste for food is partially overcome, when the vomiting very soon assumes its usual prominent place in the symptoms. The use of the

stomach tube and the detection of exaggerated visible peristalsis soon settle the diagnosis.

The class of case which is most apt to be overlooked in the later stages is that in which severe gastro-enteric catarrh has been superadded to the original condition as the result of the prolonged food-retention and perhaps also of unskilful treatment. Such cases present various difficulties, and may require close study for some days before the diagnosis can be established.

I have known of a number of cases in which the vomiting and constipation of pyloric hypertrophy had been attributed to cerebral disease.

Treatment.—The relative importance of medical and surgical treatment in this disease is still the subject of considerable difference of opinion. It may, however, be taken as certain that no surgical proceedings should ever be undertaken until suitable medical treatment has had a fair trial. In some undoubted cases, very simple dieting, with or without stomach-washing, has resulted in complete and permanent recovery. In other apparently similar cases, nothing, however carefully planned and carried out, has seemed to do any good until an operation was performed. The question as to how long it is safe, in any individual case, to risk persevering with medical measures before calling in the surgeon, when the child is showing no improvement, is one which taxes to the very utmost the judgment and experience of the physician. There is probably no more responsible and anxious question in the whole range of therapeutics. On the one hand, to persevere too long in unsuccessful medical measures, when the child is losing ground, is to take away all chance of a successful operation. On the other, too early recourse to so very serious an operation is unjustifiable, seeing that many cases are certainly curable by medical means. It is also to be remembered that, however advanced the case is, a few

days of medical treatment will practically always improve the child's condition noticeably, and render him fitter to stand an operation.

Medical Measures.—Our great object in treating this disease is to get the child to let through his pylorus enough food to nourish him and to keep him alive until the action of the stomach has become more normal. To this end there are three indications :—

1. *To remove all possible causes of irritation in the food given.*—This we aim at by lessening the bulk of the meals and by diminishing the amount of curd and of cream which they contain. I generally begin by giving 2 oz. of diluted peptonised milk every two hours. If this does not succeed in relieving the vomiting, smaller quantities ($\frac{1}{2}$ to 1 oz.) may be given for a day or two ; or some other food, such as butter-milk, whey, albumin water, or raw meat juice and barley water, may be tried. Breast-milk, if it can be obtained, is by far the best food for the child. In bad cases it may be drawn off and given iced. Little, if any, advantage can be obtained from the use of nutrient enemata.

2. *To soothe the stomach in every way.*—The child is to be kept very still, and all unnecessary movement and handling of his body are to be avoided. Washing out the stomach is recommended by most authorities, and it has seemed to me most useful. Not only does it remove the stagnating remains of former meals, but the warmth of the water used has a decidedly sedative effect. Plain water seems to do quite well, and it should be used at a temperature of 95° to 105° F. The washing out should not be done more than once or, at most, twice a day, as it is rather a tiring process for the baby. Poulticing is strongly advocated by Heubner[1] and Ibrahim.[2] It may be used thrice daily, and each time four poultices are to be applied at intervals of half an hour.

[1] *Loc. cit.*

[2] *Loc. cit.*

Opium and atropin have been recommended (Heubner, Neild [1]). I have tried them both repeatedly, but with little success; and they are both apt to disturb the child's digestion.

3. *To relieve the patient's thirst and consequent exhaustion.* —In advanced cases, when too little fluid to allay the thirst of the tissues has been passing the pylorus, the child is generally in a state of great misery on this account. Under these circumstances, immediate relief can usually be given by the subcutaneous injection of saline solution (Chap. XXV.). Copious saline enemata may also be tried, and sometimes succeed very well. The water should be allowed to flow into the bowel very slowly indeed through a small catheter, the reservoir being raised only a few inches above the body; and the proceeding should be allowed to take a long time.

Before and during the treatment the child must be carefully and repeatedly weighed at short intervals. Gain in weight is far more important than arrest of the vomiting.

Surgical Operation.—The operations which have hitherto proved successful are three in number. These are (1) gastro-enterostomy, first performed with success by Löbker (1898) [2] and Kehr (1899); [3] (2) forcible stretching of the pylorus (Loreta's operation), introduced by Nicoll of Glasgow in 1900; [4] and (3) pyloroplasty, which has been strongly advocated by Cautley and Dent, and successfully performed by the latter in a number of instances, the first being in 1902.[5]

The majority of surgical authorities have expressed themselves in favour of gastro-enterostomy. Loreta's operation, however, seems to me to have the decided advantage of being

[1] *Lancet*, Nov. 25, 1905, p. 1543.

[2] *Verhandl. d. deutschen Gesellsch. f. Chirurgie*, 29ten Kongress, 1900, I., p. 148.

[3] *Ibid.* p. 124; and Abel, *Münch. med. Wochenschr.*, 1899, No. 48, p. 1607.

[4] *Brit. Med. Journ.*, 1900, II., p. 571.

[5] *Med. Chir. Trans. Lond.*, 1903, p. 474.

a somewhat less formidable proceeding than the others, and therefore more likely to be successful. Burghard[1] has performed this operation in ten cases with only two deaths, which represents a better result than has been obtained from either of the other operations. It must, however, be admitted that, so far as the published statistics go, the results of the three operations do not differ very greatly.[2]

After the operation, in some cases, all the symptoms rapidly cease, and the patient is cured. In many others, however, the immediate improvement is slight, the wasting continues, and sometimes there is also a tendency to obstinate diarrhœa. In these it is only after weeks of careful nursing, if at all, that satisfactory improvement takes place. In this class of case the after-treatment demands the greatest care and attention; but if the child survives the first few weeks after the operation, he is likely to regain health completely, and his recovery is permanent. The anxiety which some have expressed lest the rupture of the pyloric muscle in Loreta's operation should lead in after years to cicatrisation and contraction, seems quite unfounded. The three patients first operated on in this way in Great Britain (one by Nicoll in 1900 and two by Stiles in 1902) have remained in perfect health so far as their stomachs are concerned.

In the class of case above referred to (p. 129), in which the vomiting is easily checked but the wasting goes on, surgical operations are of no use. The surgeon's part may have been done to perfection; but the child, though he recover from the operation, is none the better for it, and he often dies of diarrhœa or atrophy in spite of every care.

[1] Quoted by Stiles, *Brit. Med. Journ.*, Oct. 13, 1906.

[2] The results in those of my cases which were operated on were as follows: Pylorectomy, 1, fatal; pyloroplasty, 1, fatal; gastro-enterostomy, 8, of whom 3 recovered; Loreta, 12, of whom 4 recovered; Loreta followed by gastro-enterostomy on account of recurrence of the symptoms, 1, which recovered. In all the cases except two the operation was performed by Mr. Stiles.

CHAPTER VII

ON CERTAIN DISEASES OF THE DIGESTIVE SYSTEM—II

Summer Diarrhœa

Causation.—Although the etiology of summer diarrhœa is still obscure in several respects, many facts are known about its predisposing and exciting causes.

The principal predisposing causes are three in number: (1) a high mean atmospheric temperature; (2) early age; and (3) a weakened and deranged condition of the alimentary mucous membrane.

1. *High mean atmospheric temperature.*—When, in a town, the temperature of the air is constantly above 60° F., the mortality from this disease is always high. If even a little below that level, the disease is much less severe. Changes in the atmospheric conditions other than rise of temperature (winds, humidity, etc.) seem to have no special effect on the prevalence of summer diarrhœa.

2. *Early age.*—The disease is one of early infancy, occurring almost exclusively during the first two years of life.

3. *A weakened or deranged condition of the alimentary mucous membrane.*—In this, as in other forms of diarrhœa, any general or local condition which irritates or weakens the structure or functions of the digestive organs is to be regarded as a predisposing cause. Babies on the breast are seldom affected compared with those who are hand-fed; and those who are badly nourished, and those whose digestive

organs are irritated by improper feeding, are especially liable to be infected and to suffer severely.

The exciting causes consist in the multiplication of micro-organisms in the alimentary canal, and in changes in the chemical composition of its contents.

1. *Micro-organisms.*—In the causation of these cases it has hitherto been held that "there is not a specific micro-organism, as there is in tuberculosis, but that any one or more of a large class of germs, the individual members of which differ from one another sufficiently, morphologically, to be regarded as distinct species, may be present, and may produce the symptoms" (Vaughan [1]). These bacteria belong to species which normally inhabit the child's alimentary canal. Under normal conditions their action is beneficial, but in cases of summer diarrhœa they multiply enormously, and their products act as severe general poisons as well as local irritants to the mucous membrane of the digestive tract. In recent years the two varieties of the Shiga bacillus have been found in several of the ordinary types of acute infantile diarrhœa, especially by American observers. It is probable that future investigations may prove these organisms to be of great importance in the causation of summer diarrhœa.

The poisons produced differ in the degree of irritation to which they give rise. Some of them have been separated and administered to animals, and have been found to cause choleraic symptoms. In the great majority of cases the germs are introduced along with cow's milk. Milk is a congenial medium for them to grow in, and they multiply and flourish in it both inside and outside the child's alimentary canal.

2. *Chemical changes in the contents of the stomach and bowels.*—The exact rôle which chemical changes play in the causation of these cases is difficult to ascertain. While

[1] "Diarrhœal Diseases," Starr's *Text-book of Diseases of Children*, p. 486.

lesions of the mucous membrane and general intoxication are certainly produced by the products of bacteria, it seems exceedingly probable that the abnormal multiplication of these is often secondary to a functional chemical change in the contents of the stomach and bowel.

Symptoms.—Summer diarrhœa may be met with in the extremely acute form called "cholera infantum," because of the close resemblance which its symptoms present to those of real cholera, or in the less severe variety which resembles an unusually severe attack of dyspeptic diarrhœa and vomiting. The cases which are met with in this country are mostly of the latter type.

The patient is in the majority of cases a hand-fed baby. Sometimes he seems in good health when the severe symptoms commence. Very often, however, he has been suffering for some time from digestive disturbance, so that the diarrhœa and vomiting appear as an exacerbation of a chronic or sub-acute attack.

Before the vomiting and purging begin, the patient is restless and distressed, and his temperature is raised perhaps to 102°, 103°, or even 104° F. After a few hours of discomfort, the child vomits, first undigested food, and later watery mucus tinged with bile. Any fluid given to allay thirst is at once returned, and soon the diarrhœa commences. At first, ordinary fæces are passed, along with much wind, and preceded by colicky pains. The motions succeed one another rapidly; their yellow colour changes to pale green, grey, or brown, and they are very offensive. Finally, they have often the appearance of reddish serum. There may be ten, twenty, or more motions in the twenty-four hours.

After the first motion the temperature often falls, and the patient seems more comfortable. He loses flesh very rapidly, his eyes sink in (Fig. 12, p. 15), his fontanelle is much depressed, and he is exhausted by the repeated purging and

vomiting. The extremities become cold and clammy, the abdomen is soft and retracted.

Under suitable treatment, or even in slight cases without it, the diarrhœa and vomiting gradually cease, and the child is convalescent after a week or less. If the patient is weakly, or the attack a severe one, or the feeding injudicious, the symptoms may get worse. The temperature keeps up, the prostration increases, and the child may take fits or fall into a state of stupor, from which he does not awake. Sometimes, as the acute symptoms subside, the case passes into one of chronic diarrhœa.

The extremely severe and really choleraic attacks, which are properly called cholera infantum, differ from those just described mainly in their severity. The same symptoms occur, but they set in more suddenly and are more severe in every way; and if not checked, they are much more rapidly fatal.

Prophylaxis.—A great deal can be done towards the prevention of summer diarrhœa by attention to general hygienic precautions. It is important, when this disease is prevalent, not to allow any child to be weaned unnecessarily, the number of breast-fed babies affected being very small compared to that of those on the bottle.

Cleanliness in the milk-supply, and especially sterilisation of the milk used for the baby, and keeping it cool and protected from contamination before use, are also very important. It is not only essential to observe the greatest cleanliness in connection with the milk, but the nurse should disinfect her hands each time after touching the diapers or anything soiled with the motions. The motions, and anything soiled with them, should be carefully disposed of at once. All derangements of the digestion should be promptly and carefully treated.

Treatment. — Summer diarrhœa is due to a morbid

condition of the *contents* of the stomach and bowels, and not to any *structural abnormality* in the parts themselves. In other words, the condition is primarily one of poisoning, and any catarrhal or other changes present in the mucous membrane are to be looked upon as secondary phenomena, as they would be in arsenical poisoning. The principles involved in the treatment of these cases therefore resemble those applicable in acute poisoning: (1) the irritating material must be cleared out of the stomach and bowels; (2) the introduction of fresh causes of irritation in the food prevented; (3) antiseptics; and (4), if necessary, sedatives should be given.

1. *Evacuation of the stomach and bowel.*—The first indication is to remove as much as possible of the poison from the alimentary canal. For this purpose we wash out the stomach at once (if there is any vomiting) with warm water or salt solution. This must not be put off under the idea that the child is too weak. If the child is very weak, it makes it all the more urgent to do all that can be done as quickly as possible to remove the poison which is affecting his strength. A few ounces of water may be left behind in the stomach to allay the thirst.

The lower bowel may also be washed out with warm water, and it is recommended by American authorities to leave in it about a pint of cold water containing 15 to 20 grs. of tannic acid. The tannic acid is for the purpose of rendering inert any soluble ptomaines which may be present. The small intestine can only be reached by purgatives, and castor oil or calomel (grs. ii to v) may be used for this purpose.

2. *Stopping all food.*—The child should have no food for twenty-four hours, and for from two to four days, according to the severity of the case, he should have white of egg and water, or raw meat juice and barley water, or meat broths, and

no milk. The digestion is quite at a standstill, and therefore more nourishing food can do nothing but harm. Milk, even if it does not contain the poison which is causing the disease, is the best culture medium for the micro-organisms which are producing it in the child's body, and is therefore very dangerous.

In many cases, clearing out the alimentary canal, stopping the milk for two to four days, and properly regulating the diet, is all that is necessary to stop the attack. There are, however, various auxiliary measures which may be useful.

3. *Antiseptics.*—Antiseptics are sometimes useful, but their value has been exaggerated. The amount that can be given must always be very small compared with the matter to be disinfected. Calomel (gr. $\frac{1}{12}$), grey powder (gr. $\frac{1}{6}$ to $\frac{1}{4}$), salol (gr. i), resorcin (grs. iii to v), or subnitrate of bismuth (grs. x), may be given every hour or two hours. Dilute hydrochloric acid (♏ i to iii) well diluted, every two hours, is also very useful. These medicines often help in allaying the vomiting. Astringents are of no use.

4. *Opiates.*—Opium may be required if the motions are very frequent or accompanied by much pain. It is never to be given before the clearing out of the alimentary canal, and it is best administered separate from other medicines, so that it can be stopped when it is no longer required. Compound ipecacuanha powder, laudanum, and nepenthe are convenient forms in which to give it. Hypodermic injection of morphine (gr. $\frac{1}{100}$), repeated, if without effect, in an hour, is sometimes very useful; and an enema of starch and laudanum is also efficacious in some cases.

When collapse is present, a mustard bath or a large mustard poultice forms a useful auxiliary measure. Stimulants (whisky or brandy) are also often indicated. The hypodermic injection of strychnine forms a very valuable

stimulant measure. A quarter of a drop of liquor strychninæ (= gr. $\frac{1}{400}$ of strychnine) may be used.

Chronic Diarrhœa

Causes.—This condition may be primary—due, that is to say, to a continued derangement of function, which often gives rise, after long duration, to various lesions of the bowel (mostly the large bowel)—and it may be the result of constitutional weakness and injudicious feeding or of chronic (*e.g.* septic) poisoning. It may also be secondary, arising from a damaged condition of the intestine left by an acute inflammatory attack or some other disease.

Food which is positively or relatively unsuitable is the main cause of the continuance of the diarrhœa. The action of micro-organisms also plays a certain part. No special toxicogenic bacteria are required to account for the intestinal lesion. When the digestion is interfered with, those micro-organisms which are normally present in the bowel multiply enormously, and constitute a further source of irritation.

Symptoms.—The main symptom is, of course, the change in the character of the motions, which are generally increased in number and always much altered in character. The stools vary greatly in appearance in different cases. Sometimes they contain obviously undigested food, fragments of milk curd, fatty matter, farinaceous food, or fruit. Sometimes, especially in babies, they are of a bright green colour, sometimes yellow or brown, and sometimes they are large, pulpy, and of a putty-like appearance. They are often extremely offensive. The mother's description is usually unreliable, and it is always well to insist on seeing the motions if a child is not thriving.

The child gets gradually weaker and thinner, nervous and irritable. The appetite often remains good—sometimes it is

excessive, and the child will eat far too much if it is put before him. The tongue is usually dry and red, and it may be coated. The skin round the anus is apt to be irritated, and sometimes prolapse occurs. There is occasionally considerable œdema of the lower limbs, without any nephritis.

The duration of the diarrhœa varies. If not energetically treated, it may continue indefinitely. Often there are acute exacerbations from time to time. If the case ends fatally, death is due to one of these or to some intercurrent disease such as bronchitis, pneumonia, or nephritis.

Diagnosis.—The lungs and other organs must be carefully examined for signs of disease, especially for tuberculosis, and the child's personal and family history inquired into. Long continuance of the diarrhœa is not, of itself, a sufficient reason for regarding the case as tuberculous.

Prognosis.—This varies much, according to the nature of the cause and whether it can be removed. It depends a great deal on the willingness and ability of the parents and nurses to carry out their instructions literally, and to some extent also on the hygienic surroundings.

Treatment.—A thorough revision of the diet is the most important thing, and, while this is being attended to, the child should be regularly weighed in order to ascertain his progress. In severe cases in young infants nothing is so beneficial as the milk of a good wet-nurse. If the baby is on the bottle, we must investigate whether he is having too much casein or sugar or cream, also whether the food is being prepared with due care as to cleanliness, and given in reasonable quantities and at proper intervals. In bad cases it is usually necessary to stop milk altogether and to give only meat broths, raw meat juice, or white of egg water (Appendix F) for a time, or in older children some form of bland farinaceous food such as arrowroot.

It is, generally, either the proteids or the carbo-hydrates which cause difficulty in digestion. Professor Vaughan says[1] that, if it is the proteids, the stools are alkaline and putrid; and if the carbo-hydrates, they are usually acid and associated with gas formation. If we can get a clear indication as to which element of the food is at fault, it is important to stop that element at once; and if we cannot be sure, it is far better to stop one of them experimentally than to go on with a mixed diet. Often the substitution in place of milk, of cream, diluted with barley water or whey or potash water, is at once followed by improvement.

Fresh air is essential, and the patient may benefit greatly from a change to the country. His skin must be got to act freely, and he must be carefully and warmly clad. As for medicines, bismuth is useful in large doses (grs. viii to xvi or more every three or four hours, F. 8), and resorcin, salol, salicylate of soda, and grey powder are sometimes useful. Irrigations are sometimes followed by improvement. Dilute hydrochloric acid (2 minims every two to four hours) is often of great value, and occasionally small doses of opium may be added to it with advantage. When the motions contain much mucus and are passed with straining, much benefit often follows the administration of ♏ iii to v of liq. hydrarg. perchlor. every hour or two hours. In cases where the motions are very frequent and watery and contain various coloured mucus and blood, Dr. Eustace Smith strongly recommends nitrate of silver—$\frac{1}{8}$th of a grain with one drop of dilute nitric acid and one drop of laudanum every four hours. Alcohol is often very useful, and, when the patient is recovering, tonics such as arsenic, nux vomica, and cod liver oil should be given.

[1] "Diarrhœal Diseases," Starr's *Text-book of Diseases of Children*, p. 486.

Lienteric Diarrhœa

Causation.—This is a form of diarrhœa which is not due to injudicious feeding, but apparently to an over-excitability of the nervous system. It is met with commonly in children about five or six years old. It is important to remember that it may also occur in very young infants. In these its nature is apt to be overlooked, and therefore the proper treatment not given.

Symptoms. — In these cases the taking of food sets up a sudden peristalsis, so that the children are interrupted in their meals by griping pains, and have to leave the table hurriedly to have their bowels moved. The motions are composed of undigested food and mucus.

Treatment.—The condition is not benefited by astringents, but is generally rapidly cured by the administration of Fowler's solution of arsenic in drop doses immediately before each meal. In young infants half or one-third of a drop may be sufficient. If the case is obstinate, an opiate may also be given, but this is rarely found necessary.

Chronic Intestinal Indigestion
(*Mucous Disease* (*Eustace Smith*))

This is a very common form of dyspepsia, the main feature of which is an inability to digest and absorb an ordinary amount of certain common articles of diet—especially starchy foods. It is present, to some degree, in a very large proportion of delicate children. In slight cases the symptoms are so trivial as readily to escape notice, but in the severer types they are very marked, and may even simulate closely those of serious organic disease. From the point of view of general practice there are few more important maladies in early life, because it is so often met

with. It is found in all ranks of society, and is especially frequent and severe in the children of gouty and neurotic parents. It often appears between the third and fifth year; but it is common in older children, and indeed at all periods of childhood.

Symptoms.—These may be divided into three groups: (1) there are indications that something is interfering with the child's growth and nutrition; (2) there are various signs that the digestive organs are out of sorts; (3) there are derangements of the nervous and other systems, obviously due to auto-intoxication.

The patient is generally thin and delicate-looking; he is often slightly built and looks young for his years. He is usually pale-faced, although his mucous membranes often show no marked anæmia. The skin is soft and normal except in bad cases. The limbs are slender and feeble, and all the muscles poorly developed. The hands and feet are apt to be cold and flabby. Not infrequently there are signs of the presence of adenoids.

On investigating the state of the alimentary tract, we find various more or less indefinite signs of derangement. The tongue may be fairly clean, but usually it is covered with a slight brownish fur and has a peculiar slimy appearance. In bad cases the breath may be offensive, but often this is not so. There is frequently a short dry cough—a "stomach cough." The abdomen is often more or less distended, although nothing further can be made out on palpation. The bowels are generally constipated, the motions being pale and pasty, sometimes clay-coloured, and occasionally very offensive. Sometimes chronic diarrhœa occurs with large foul-smelling stools, and occasionally there is lienteric diarrhœa. There is often a noticeable increase of mucus in the motions; and even when this cannot be seen on naked-eye examination, it may be revealed by the microscope.

The presence of thread-worms is a common complication. At times the motions seem quite normal. The appetite may be very poor, or excessive, or fairly natural. We sometimes get a history of recurrent abdominal pains of a colicky nature, and sometimes there are frequent attacks of acute indigestion.

The last group of symptoms are those which are due to intestinal auto-intoxication. The child is not only pale and thin, but often looks wearied and miserable, and has dark rings round his eyes. A considerable proportion of the older patients complain of headache, and in some of them there are regular attacks of migraine. Although many of these children are very bright and intelligent, they get soon tired and irritable. Sudden attacks of pallor or of faintness are sometimes noticed, and, in young children, convulsions may occur. Rarely, we meet with a degree of drowsiness, irregularity of the pulse, and vomiting, that are extremely suggestive of tuberculous meningitis. Sleep is often restless and disturbed. Night-terrors are common, and, in older children, somnambulism. Grinding of the teeth is very usual, and nocturnal enuresis not uncommon. Profuse perspiration is a frequent symptom. A persistent evening rise of temperature is not uncommon, and may last for weeks. The urine is high-coloured and strong-smelling, and shows a marked indican reaction. Occasionally albumin is present.

Diagnosis.—There is no class of cases more often misunderstood, and therefore ineffectually treated, by young practitioners. Various mistakes may be made. Sometimes the children are supposed to be, in a general way, "tubercular," and therefore cod liver oil is given to them till they are altogether put off their food and sickened by it; or the diagnosis is "debility," and prolonged courses of ferruginous tonics are administered with a somewhat similar result. Very

often, because they are thin, an extra supply of "milk-puddings" and other farinaceous foods is ordered to fatten them; or, on account of their constipation, they are given large quantities of porridge and fruit.

Prognosis.—This varies according to the degree of injudiciousness with which the child has hitherto been fed, and the extent to which his mother can and will carry out instructions. If the feeding has been quite on wrong lines and is consistently altered according to directions, the result is often strikingly successful. If the child's former dieting, however, has been fairly judicious, his improvement may be very slow. If the reform in diet is carried out incompletely and intermittently, the effect of the treatment is sure to be disappointing.

Treatment.—In commencing the treatment of the case, the parents must be warned that it has to be persevered in for many months if permanent benefit is to be secured. They must also be made to realise that success depends only to a slight degree on medicines, and is mainly due to the carrying out of a great many small details—dietetic, medicinal, and hygienic.

Dietetic Rules.—The exact details of the diet to be ordered in any given case must vary considerably according to the child's age and social circumstances, and also to the stage of the malady and its degree. The main point to remember is that these children are unable to digest anything like the amount of starchy food usually enjoyed by healthy children, and that sweets, fruit, and vegetables are also apt to aggravate their condition. In many of them, also, pure milk is not well borne, and fats too have often to be limited in amount.

The following table, while it indicates the line to be

taken in such cases, must of course be varied considerably in individual instances :—

MAY NOT BE TAKEN.	MAY BE TAKEN.
Ordinary bread, biscuits, porridge.	Toast (done hard in the oven), rusks.
Farinaceous puddings (sago, rice, tapioca, arrowroot, cornflour).	Malted foods ("Veda Bread," "Grape Nuts," "Force," etc.).
Pastry, cheese, sweets of any kind.	Any of the malted "Infants' Foods," calf's-foot jelly, lemon sponge.
Much butter, any jam.	A little butter or jelly.
Thick or vegetable soups.	Clear soup, beef-tea, chicken-tea.
Fried or salt meats.	Underdone meat, chicken, rabbit, fish, tripe, eggs (usually).
Vegetables (except as opposite).	A little cauliflower, a *little* mashed potato.
Fruit.	Fruit juice.
Plain milk.	Modified milk, whey, milk and potash or lime water.
Cocoa, tea, and coffee.	Milk prepared with peptogenic milk powder (with half the usual amount of cream), malted milk.

The child should not be pressed to eat more than he is inclined for, and four small meals are better for him than three larger ones.

Medicinal Treatment.—The chief medicines to be given consist in alkalines, tonics, and laxatives. Soda with rhubarb or nux vomica (F. 10) is generally useful, and if there is much anæmia iron may be cautiously tried—ferrum redactum or a laxative iron mixture (F. 11); cod liver oil is rarely well borne. Intestinal antiseptics such as salol are usually of little benefit, but an occasional dose of calomel generally does good. When constipation is present, cascara or compound liquorice powder, or compound decoction of aloes or Carlsbad

salts, may be given. Massage to the abdomen is helpful in some cases.

Hygienic Treatment.—Careful attention must be paid to the child's clothing, as recurrent chills (*e.g.* from bare arms and legs) are apt greatly to aggravate the condition. A cold douche with suitable precautions is usually beneficial, and open windows and exercise in the open air are very important. Over-exertion of any kind, however, is to be carefully avoided, and emotional excitement is also to be guarded against. In the case of the younger and more nervous patients, a midday rest in a darkened room is of great advantage, even if the child does not sleep.

Complete change of air and scene do more good than any other single measure. Many of these children, who are chronic invalids at home, lose all their symptoms during their summer holiday, without any other special treatment. With some patients the seaside agrees very well, but hill air is preferable in a majority of the cases.

Intestinal Worms

The intestinal parasites commonly met with in children are of three kinds: thread-worms, round-worms, and tape-worms. Thread-worms are much the commonest variety; tapeworms are rare in children under six years.

With regard to all these worms it may be said that the diagnosis of their presence depends almost entirely on the discovery of the parasites or their ova in the stools, and that the general symptoms present usually differ in no important respect from those of chronic intestinal dyspepsia. The treatment of worms of all sorts requires close attention to details and sometimes great perseverance.

Thread-worms (*Oxyuris Vermicularis*).—Thread-worms live mostly in the cæcum and appendix, and there are good

reasons for thinking that they sometimes breed there.[1] They are also found in other parts of the colon, in the rectum, and, less frequently, in the small intestine. The ova are taken in by the child along with his food; and they are apt to be constantly re-introduced by his fingers, which become contaminated owing to his scratching the neighbourhood of the anus.

The general symptoms are mainly those of chronic intestinal catarrh, but sometimes nervous symptoms such as convulsions are also met with. Local symptoms of various kinds, due to the irritation of the worms, are often present. Among these are severe itching about the anus, mucous diarrhœa, tenesmus, prolapse, frequent micturition, priapism and vulvar discharge. The nostrils, also, are sometimes red and sore from the child's picking his nose with fingers soiled with the irritating substance of the thread-worms.

Treatment.—To be successful, the treatment must aim not only at expelling the parasites, but also at preventing reinfection and improving the general health.

Expulsion of the Worms.—To drive the worms down into the lower bowel, a dose of castor oil, or of calomel and santonin (āā gr. i), may be given. When this has acted, the colon should be cleared by a large soap and water injection. It is well to use a vermicide enema after this, and to repeat it every alternate morning for a week. For this purpose, a solution of common salt (a teaspoonful to 5 ounces) or infusion of quassia (5 to 7 ounces) may be given. The fluid is to be introduced very slowly and allowed to stay in as long as possible.

Prevention of Reinfection.—This is most important, and it is often forgotten. The anal region must be carefully washed after each motion, and it should be smeared with ung. hydrarg. The child's nails should be kept very short, and they must be frequently brushed with carbolic soap. Any uncooked vegetable food that he takes must be carefully washed.

[1] Still, *Brit. Med. Journ.*, April 15, 1899.

Improvement of the General Health and of the Digestion. —Both general debility and indigestion tend strongly to favour the presence of worms. Iron or bitter tonics may be required; and the diet should be regulated on the lines recommended for chronic intestinal dyspepsia (p. 147).

Round-worms (*Ascaris Lumbricoides*). — These live mostly in the small intestine, but are apt at times to wander into other parts of the alimentary canal. The ova are swallowed in impure water.

The symptoms are usually indistinguishable from those of dyspepsia. Sometimes persistent diarrhœa occurs. Convulsions and other nervous symptoms are not uncommon.

Treatment. — This consists in the administration of santonin alone or combined with calomel (āā gr. i). The powders may be given every night for three nights, and should be followed in the morning by a dose of senna or salts.

Tapeworms.—The *Tænia Mediocanellata* or beef tapeworm is much the commonest species in Britain; though the *T. Solium*, acquired from pork, is sometimes found. While these species are too well known to require description here, attention may be specially called to the *T. Cucumerina*, which is occasionally found in young children who are in the habit of playing with animals. This tapeworm is small and short (6 to 12 inches), and its proglottides are long and narrow and are usually separate when passed. They look like rather large and flat grains of boiled rice. The larval form develops in the louse of the dog and other animals, and is probably conveyed to the child's hands or to his food by the animal's tongue. Tapeworms usually live in the small intestine.

Treatment.—Tapeworms are often very difficult to dislodge. The treatment ought therefore to be most careful and thorough. The patient must be kept in bed, and should be prepared beforehand by a very restricted diet for two or

three days. This should consist in food calculated to lessen the secretion of mucus in the bowel, such as soups, broths, jellies, Benger's Food, and eggs; and all farinaceous food should be especially avoided. The bowels are meanwhile to be kept moving by means of small doses of some laxative, such as cascara, given several times a day, or by a dose of salts every morning. The vermifuge generally used is male-fern, and it may be given in the following way: A dose of castor oil is administered at night, and no food is given after it until the worm is expelled. On the morning following the administration of the castor oil, the patient receives three doses of extr. filicis liq. (♏ xxx) at intervals of an hour; and these are followed in three hours by another dose of castor oil. The extract of male-fern is given as an emulsion with fresh mucilage (℥i) and peppermint water (℥i), or, in older children, in capsules.

Trichocephalus dispar is not very rare in older children. It produces no symptoms, and no drug seems to have any marked effect on it.

Acute Intussusception

This is a most important, as well as characteristic, disease of infancy, as it accounts for fully three-fourths of the cases of acute obstruction of the bowels in young children. It occurs most frequently in babies between 4 and 8 months; and a considerable majority of the patients are under one year. Older cases, however, are not uncommonly met with.

Symptoms.—The onset of the disease is almost always quite sudden; although, in a considerable proportion of the cases, the acute symptoms are preceded by some days of gastro-intestinal derangement. Occasionally there is a history of a sudden fall or other forcible movement of the body having occurred just before the child took ill.

The main symptoms are three in number: (*a*) abdominal

pain; (*b*) vomiting; and (*c*) passage of blood and mucus with straining.

The *pain* is nearly always the first thing noticed. It has the characters of severe colic and is accompanied by loud screaming and kicking. It goes on recurring at short intervals for a varying period, and then, after perhaps twenty-four or thirty-six hours, paralysis of the bowel sets in and gangrene threatens. The patient then gradually becomes drowsy, and the spasms cease to return.

The *vomiting* is severe and repeated, and generally sets in immediately after the pain begins, though occasionally it is noticed before it.

The *passage of blood and mucus from the bowel with straining* is the other chief symptom, and is rarely absent when the patient is a baby. It sometimes follows immediately after the other symptoms, but usually there is an interval of some hours. The duration of this interval depends on the situation of the intussusception and on the degree of congestion of the affected parts. Generally at the first onset of the symptoms there is a forcible discharge from the bowel of any fæces it may contain. Thereafter nothing comes but blood and mucus.

Physical Signs.—The patient is generally a fat, well-nourished infant, and in the intervals between the pains he looks fairly well, though there is always some collapse and the pulse is rapid. The degree of collapse varies greatly in different cases; sometimes it is extreme, and the patient presents a typically abdominal facies. The temperature is normal or subnormal at first. If there is any fever, it usually indicates the presence of inflammatory complications.

The abdomen is generally soft and not much distended, and it moves freely with respiration. There may, however, be considerable tenderness over the intussuscepted portion of bowel, and consequent rigidity of the abdominal wall. When

this is so, an anæsthetic may have to be given to allow a satisfactory examination.

In the great majority of cases, though not always, a firm sausage-shaped tumour is felt on careful palpation. It may be situated almost anywhere in the abdomen, the exact position depending on how far the invaginated portion of bowel has travelled. It differs considerably in different cases in size and in mobility as well as in hardness. Sometimes the right iliac fossa is found to be noticeably empty.

The lower end of the intussusception may often be felt per rectum, and the examining finger when withdrawn is found to be covered with blood. Even when the intussusception cannot be felt in this way it may be possible to palpate it easily on bi-manual examination. Occasionally the invaginated bowel is protruded through the anus.

In older children the symptoms of intussusception are often less definite, and the diagnosis, therefore, much more difficult. The onset may be less distinct and the tumour very difficult, or even impossible, to find; and there may be no passage of blood or mucus from the bowel. The obstruction, also, may not be complete, and fæcal matter may therefore continue to be passed.

Diagnosis.—If a trustworthy account of the onset of the symptoms can be obtained, the diagnosis is generally easy, even when the tumour, as sometimes happens, cannot be clearly defined. When any doubt exists, the fullest abdominal and rectal examination under an anæsthetic should be made *at once*, as it is of the utmost importance that the treatment should be begun without the slightest unnecessary delay.

The condition most liable to be mistaken for intussusception is severe ileo-colitis, and the difficulty occurs mainly in older children. In this the onset is not so sudden, the vomiting is less urgent, bile pigment is more likely to be found in the stools, the blood is more intimately mixed with the fæces,

and there is some fever. It is, of course, possible that the two conditions may co-exist.

Course and Progress.—In rare cases complete reduction takes place spontaneously. Occasionally, though scarcely ever in young babies, the invaginated portion of gut sloughs away and is passed with the motions, and the child slowly recovers. Spontaneous recovery, however, is so very uncommon that it can never be expected. If it does not occur and the invagination is not successfully relieved, the child soon passes into a state of collapse and dies, generally within three, four, or five days, sometimes even within twenty-four hours.

Treatment.—There are two methods of treatment which have proved successful in intussusception: (1) distention of the bowel by water or air introduced by the rectum; and (2) laparotomy, with reduction of the intussuscepted bowel by direct manipulation.

1. *Distention of the bowel* from the rectum may be effected by warm water from an ordinary douche apparatus or a Higginson's syringe, but inflation with air by means of a small bellows is probably more effective. The child must be fully anæsthetised, and while the air or water is being introduced, the nates should be firmly compressed to prevent return, and the abdomen should be carefully palpated. The proceeding should be carried out slowly and deliberately, and the distention should be continued for some time. There is considerable danger that the intussusception may be only partially reduced, and may recur. If complete reduction has taken place, a fæcal motion usually occurs shortly after, and the child seems greatly relieved.

Whichever method of treatment is employed, it is often desirable, whenever the diagnosis is made, to administer a dose of laudanum to soothe the pain and assist the action of the anæsthetic. Opiates should not, however, in any case, be

gone on with or given in large doses, as they are apt to mask the symptoms and interfere with the digestion.

2. *Laparotomy.*—The details of the operation need not be considered here. It may, however, be mentioned that the reduction is always to be attempted by manipulating the apex of the intussusception through the sheath, and pressing it up from below, and never by pulling on the bowel above it. When reduction is found impossible, the intussusception may be excised and the cut ends of bowel united or an artificial anus may be made. Under these circumstances, however, the chance of recovery is extremely small.

Choice of Treatment.—Not very many years ago, the mortality from laparotomy in these cases in young infants was so very great, even in the hands of distinguished hospital surgeons, that the somewhat unsatisfactory proceeding of distending the bowel from the rectum was much preferable, because it offered a far better chance of recovery. Now the progress of the surgical art has changed this state of things entirely, and there cannot be any doubt whatever that immediate operation by an experienced and competent surgeon is altogether better and safer than any other kind of treatment. In proof of this, I need only mention that out of the last twenty-four cases of acute intussusception operated on by Mr. Stiles in the Royal Edinburgh Hospital for Sick Children within thirty-six hours of the onset of symptoms, twenty-three recovered (*i.e.* 95 per cent.).[1]

The drawbacks to the treatment by distention of the bowel are many and important. At best, it can only be expected to succeed in very recent cases; for, though an intussusception has been reduced in this way as late as the seventh day (Cheadle), this is a very exceptional experience, and even by the end of

[1] Full details of the cases of acute intussusception operated on in the Edinburgh Children's Hospital up to May 1906 will be found in a recent paper by Henry J. Dunbar (*Scot. Med. and Surg. Journ.*, August 1906).

twenty-four or thirty-six hours the intussuscepted portion of gut may have become so much swollen from œdema as to be irreducible. If it fails, much undesirable loss of time will have occurred, because it takes some time to make sure whether the reduction has been complete; and if even a small part remains invaginated, the intussusception will, naturally, soon be as bad as ever again. Should the lesion be situated above the ileo-cæcal valve, no effect can, of course, be expected from inflation. There is said to be some danger also of a rupture of the bowel taking place from the artificial distention. In early cases, in young babies this must, however, be very small indeed.

Although it is clear that reduction by the injection of air or water should not be thought of when competent surgical assistance is at hand, this proceeding is by no means to be neglected under other circumstances. Its application during the first few hours after the onset of the illness is much safer than operation by an inexperienced surgeon would be at the time, or probably even than operation by a first-rate surgeon would be twenty-four or thirty-six hours later. It has the advantage that the necessary apparatus is always obtainable, and that its use requires only ordinary sense and tact. It may also be said that, if these are used, and the reduction is not effected, no serious harm has been done, and when the surgeon does arrive the operation may still succeed. Distention, moreover, when practised early, is quite often successful. My own experience of it is small, being confined to three cases which were under my care many years ago. In one of these—an older child—the intussusception was only partially reduced, but recovery took place ultimately, portions of the invaginated bowel having sloughed and been passed per anum. The other two cases, which occurred in strong, healthy babies, and were dealt with at an early stage,

were completely successful. In all three air was used, though, in one or two, water was first tried unsuccessfully.

Appendicitis

Appendicitis may occur even in breast-fed babies of a few months, and it is not rare at any period of childhood. The symptoms in children differ in no important respect from those in adults, and perforation and gangrene often take place.

Symptoms.—The onset is generally acute, severe abdominal pain with local tenderness, vomiting, often with diarrhœa, a foul tongue, and fever are the first symptoms in most cases. The local tenderness is an extremely important point. It is generally found in the right iliac or lumbar region, but may also be present elsewhere. The pulse is usually rapid (120 to 140). Sometimes obstinate constipation is present, and occasionally tenesmus. Bladder symptoms and rectal tenderness are common, and usually indicate either an inflamed pelvic appendix, a pelvic abscess, or general pelvic peritonitis. The temperature keeps up and the vomiting usually continues, and within a few days, in an advancing case, some inflammatory induration can be made out in the right iliac or lumbar region.

Diagnosis.—In all cases of acute abdominal disease with local tenderness, quick pulse, and vomiting, appendicitis should be suspected. If there is constant pain, and most of all if there is distinct tenderness on pressure over the appendix region (or even elsewhere in the lower half of the abdomen), this is strongly in favour of the diagnosis. The presence of bladder symptoms is also confirmatory. A rectal examination should always be made in any doubtful case, and is often of great value.

Among the diseases most often mistaken for appendicitis are the following: acute general peritonitis from pneumo-

coccal or streptococcal infection; acute exacerbations of tuberculous peritonitis, such as may occur from the rupture of a mesenteric gland abscess; acute entero-colitis (which indeed is not very rarely present along with the disease of the appendix); intussusception, and typhoid fever. Strangulation by a Meckel's diverticulum is a rare condition, but when it does occur, its symptoms are indistinguishable from those of appendicitis. Occasionally simple impaction of hard fæces may also simulate this disease.

Acute pleuro-pneumonia of the right base sometimes gives rise to abdominal pain and acute tenderness very like those of appendicitis. In young children severe attacks of gastric influenza and of cyclic vomiting may also, in their early stages, be very difficult to distinguish from it. In girls about the time of puberty, symptoms suggestive of subacute appendicitis are sometimes caused by ovarian disturbances. The tenderness in them, however, is generally to be made out on both sides.

Treatment.—In watching a doubtful case, it is very important to abstain from giving opiates, which mask the symptoms; also, especially, to avoid purgatives, which greatly increase the risk of perforation; and, lastly, to give no food. Acute perforating cases are so common in children, that, when the diagnosis is made, the necessary operation should, in the great majority of cases, be done with the least possible delay.

Congenital Hypertrophic Dilatation of the Colon (*Hirschsprung's Disease*)

In examining cases of great distension of the abdomen of long standing in young children, it is well to bear this rare disease in mind. In it we find enormous dilatation of the colon, with great thickening of its wall, due to hypertrophy of the muscular coat. Sometimes the whole lower bowel is affected, but often only a portion of the colon is

enlarged. In the most typical cases there is no stricture or other obstruction below the dilated part.

Symptoms.—The child, who is nearly always a boy, suffers usually from *extreme* constipation, which dates from birth, or, less commonly, from a few weeks after birth. The abdomen may not be very large at first, but it soon increases in size, and in time becomes enormous, displacing the thoracic organs upwards, and ultimately, in some cases, causing œdema of the lower limbs. As the abdomen grows larger, the hypertrophied bowel is noticed from time to time to stand out on the surface, and exaggerated peristaltic movements are seen passing along it.

At first the child's general health seems little affected by the state of the colon. Afterwards, however, it always suffers, and he becomes thin and feeble, and shows signs of dyspepsia and of toxic absorption from the intestinal tract. In the later stages, which may be reached within the first year or two, or not until the child is ten or twelve years old, and sometimes not till adult life, diarrhœa sets in, and large offensive liquid stools are passed. Towards the end there may also be some rise of temperature. These terminal symptoms probably coincide with the appearance of extensive ulceration in the bowel—the result of the prolonged fæcal retention. Death takes place with symptoms of exhaustion and sepsis, and with dyspnœa from the pressure upwards of the distended bowel. In cases which survive to adult life there is a great risk of volvulus occurring.

The **pathology** of the condition is still very obscure, and many theories have been formed about it. It seems not improbable that the primary defect may lie in the nervous mechanism of the bowel. If such a defect existed, and gave rise to inco-ordination in the peristalsis, so that one part of the tube constantly worked against another instead of in harmony with it, the muscular hypertrophy could be

readily explained as the result of the consequent habitual overwork.[1]

Diagnosis.—The history of the onset of the symptoms and the absence of ascites, glandular masses, or adhesions, should serve to distinguish this condition quite easily from abdominal tuberculosis, for which it is sometimes mistaken.

Prognosis.—Improvement under treatment is common; but it is doubtful whether complete recovery ever occurs.

Treatment.—Careful *dietetic* and *medicinal* treatment is of considerable value in giving relief during the earlier stages. The bowels should be relieved every two or three days. For this purpose combinations of strychnine, belladonna, and aloes may be used, or magnesia or Carlsbad salts. An occasional dose of calomel is sometimes beneficial, and massage may be useful. Later, recourse must be had to enemata. Extreme flatulent distension of the colon may sometimes be greatly relieved by the passage of a long tube into the bowel.

Several *surgical* operations have been practised with a varying degree of success. Of these, three may be referred to. (1) *Colotomy.*—This gives considerable relief by preventing the distressing distension of the colon due to the accumulation of flatus. (2) *Anastomosis*—the ileum being joined to the pelvic colon. The result of this has, in my experience, been rather disappointing. (3) *Resection of the dilated pelvic colon.*—As the dilatation and hypertrophy usually reach right down into the rectum, this operation cannot be completely effected; and subsequent over-distention of the portion left may give rise to trouble.

Abdominal Tuberculosis

In this country the abdominal cavity is a very frequent site of tuberculous lesions in young children after the first

[1] Thomson, "On Defective Co-ordination in Utero as a Probable Factor of Certain Congenital Malformations," *Brit. Med. Journ.*, Sept. 6, 1902.

year of life, and it has long been recognised that in this situation the disease is much more amenable to treatment than in most other parts of the body.

It is not common, however, in children to find the tuberculous processes confined to the abdomen. In most instances an older focus of disease exists in the thorax or elsewhere. It is also noticeable that in early life tubercular lesions tend to spread rapidly to neighbouring parts, so that it is rare to find a pure case of peritoneal, intestinal, or mesenteric gland affection. Usually the disease in these different situations is only part of a more or less generalised infection. It is well, therefore, to regard tuberculous peritonitis, tuberculous mesenteric gland disease (*tabes mesenterica*), and tuberculous ulceration of the bowel as merely different manifestations or phases of abdominal tubercle, rather than to describe them as separate diseases.

Abdominal tuberculosis, then, takes various clinical forms, the chief of which may be enumerated as follows:—

1. *Ascites*, in which the eruption of tubercles on the peritoneum is accompanied by the effusion of fluid either into the general peritoneal cavity or into a part of it shut off by adhesions. Tuberculous peritonitis is far the commonest cause of ascites in children.

2. *Adhesive peritonitis*, in which there is more or less general glueing together of the intestinal coils with or without suppuration or the formation of caseous plates.

3. *Caseous mesenteric glands* (*tabes mesenterica*).—Generally these give rise to no local symptoms.

4. *Tuberculous ulceration of the bowel* may occasion obstinate diarrhœa, but often its symptoms are very indefinite. If at all extensive, the mesenteric glands will be markedly affected.

5. *Stenosis and obstruction of the bowels*, as the result of tuberculous ulceration or adhesions, is occasionally met with,

and is very important to recognise, with a view to its relief by surgical operation.

Symptoms.—These vary according to the parts first and most severely affected. In the great majority of cases, however, the onset is insidious and the first symptoms slight and equivocal. The child is noticed to be getting thinner and paler and weaker, while his abdomen is steadily enlarging. The tongue is often quite clean. The appetite is small or capricious. The motions may be very unhealthy in character, and often there is alternate diarrhœa and constipation. Sometimes there are attacks of abdominal pain, but often none are complained of. The temperature may be normal, but it is often raised in the evening; and there may also be marked evening perspirations.

Physical Signs.—The condition of the abdomen varies considerably in different cases and at different stages in the same case. When free fluid is present to any extent, the usual signs of ascites are easily made out, and in many cases nothing else can be discovered. In cases with much adhesion of the intestine, extreme tympanites is not uncommonly found, and it often resists all attempts at treatment by diet or drugs. Sometimes all that can be felt is a peculiar sense of resistance, along with gurgling in many cases. This is due to the coils of intestine not moving on one another as in a normal abdomen. Sometimes flat caseous masses, often with sharp edges, are easily felt just below the parietal peritoneum or more deeply situated. When suppuration takes place, there is often, sooner or later, a rise of temperature, and the abdomen may become tender. In time, the umbilicus and its neighbourhood become reddened and prominent; and, if nothing is done to evacuate the pus, it makes its own way to the surface in this situation.

Caseous glands, if numerous, often form large hard masses which are easily palpated in many cases. If the child resists

palpation, however, even large glandular masses may escape detection unless chloroform is administered. A rectal and bi-manual examination is also generally advisable. Occasionally an abscess connected with a gland, or with an intestinal ulcer, bursts into the peritoneal cavity. When this occurs, symptoms of acute peritonitis are set up, and the case may be indistinguishable from one of appendicitis or septic peritonitis. In extensive ulceration of the bowel there may be considerable tenderness on palpation.

Stenosis of the bowel leads to distention of the portion of intestine above the obstruction with hypertrophy of its walls. When this occurs, there are often very severe recurrent attacks of abdominal pain. During these the coils of hypertrophied and dilated bowel stand out prominently on the surface of the abdomen, and its peristalsis is very noticeable (p. 83). This appearance is characteristic, and should not be overlooked, as it indicates a serious condition which requires a surgical operation for its relief.

A type of case often occurs in well-nourished, previously healthy children which is apt to pass unrecognised. In this, feverish attacks of a remittent type lasting two or three weeks recur at intervals of a few months. No other marked symptoms are present, and the first attack, at least, is very apt to be diagnosed as a mild case of enteric. The real nature of the illness becomes evident later when it has occurred more than once. In each of these attacks there is probably a fresh, but limited, eruption of tubercles on the peritoneum, and, as the symptoms subside, an area of new adhesions is left, which in time leads to the characteristic sensation on palpation. These cases, when early and energetically treated, generally recover most satisfactorily and permanently.

Diagnosis.—In most cases this is easy, except in the early stages. Suspicions of the tuberculous nature of the

case are very strongly confirmed if the lungs are found also affected; likewise, if there is a distinct family history of tubercle or if a phthisical person has been associating much with the child. The obstinate continuance of diarrhœa in a young child, in spite of careful treatment, along with a hectic temperature, may arouse suspicions of tuberculous disease, but does not prove it. There are no special features characteristic of tuberculous diarrhœa.

Prognosis.—When the abdominal condition is not complicated by the presence of severe tuberculosis elsewhere, when it is not in a very advanced stage, and when there is no previous cachexia, the chance of recovery under proper treatment is very considerable. Thoroughly energetic treatment, begun fairly early and consistently persevered in, is often surprisingly successful. Recovery, indeed, need scarcely ever be despaired of except in very advanced and cachectic cases. As a rule, it may be said that the older the child is the better is the prognosis.

Treatment.—In this, as in most other forms of tuberculosis in children, if we are to get the best results there must be what Osler calls "masterful management" of the case in the early stages. Thoroughgoing and intelligent open-air treatment must be insisted on, and no half-measures allowed. So long as there are any acute symptoms, the patient is better in bed, but his bed should be where it can be lifted easily into the open air.

In addition to open-air treatment, every possible means must be used to increase the child's nutrition without disturbing his digestion and irritating his bowels. All indigestible articles must, of course, be forbidden. Starchy foods have to be given sparingly. The more milk and cream the child can digest the better, but the amount given must be carefully regulated according to the state of the motions. Underdone meat minced, raw meat pulp, raw meat juice, eggs in various

forms, fish, plasmon, somatose, etc., are of great value in the diet. Alcohol is sometimes very beneficial, and either brandy and egg mixture or port wine may be given.

Cod liver oil, iron, creasote, and arsenic are all useful at times, provided they can be given without upsetting the digestion or lessening the appetite. The application to the surface of the abdomen of iodoform ointment (10 per cent.) or of mercurial ointment seems certainly to do good in some cases. If there is much pain, extract of belladonna in glycerine (1 to 4) may be applied on lint. Should the fluid in an ascitic case increase so as to embarrass the breathing, or should it remain for more than a fortnight without diminishing, it is generally advisable to draw it off with a Southey's tube, unless a surgical operation has been determined on.

On the place of surgery in the treatment of this disease there is still considerable difference of opinion. All are probably agreed that the operation is necessary when abscesses form or when stenosis is present to an extreme degree. It is also generally held that when the peritoneal cavity is to a large extent obliterated by adhesions, surgical operation is dangerous and not likely to benefit in most cases. The removal of tuberculous mesenteric glands is not possible or advisable.

The chief difference of opinion refers to those cases in which the peritoneum, though studded with tubercle, is not yet firmly adherent, and especially to cases of tuberculous ascites. Some years ago, a simple free incision into the peritoneal cavity, with evacuation of any fluid it might contain, was regarded as greatly increasing the child's chance of life. Many cases have certainly made a satisfactory recovery after this simple operation. There has, however, always been some difficulty in determining to what extent the improvement was attributable to the surgical proceeding,

because the type of case which did best after it was exactly that which most often recovered under purely medical treatment. In recent years, several very competent observers [1] have expressed strong doubts as to whether the opening of the peritoneum does any good whatever, and have suggested that it is in spite, rather than because, of the operation that the children recover.

My own belief is that formerly too much was expected from laparotomy in tuberculous ascites, but that it is, nevertheless, decidedly beneficial in suitable cases. When thorough medical treatment, energetically carried out, has failed to arrest the symptoms, and the disease is showing no signs of abating, rapid and continued improvement often follows incision, at least in older children and adolescents; and the risk of the operation is exceedingly small. Whether young infants are benefited by laparotomy is much more doubtful, and the risk in them is certainly much greater. Implication of the pleura and even a slight lung affection is not necessarily a contra-indication to operation.

[1] J. Comby, *Rev. de Méd. des Enf.* t. v., 1902, p. 577; Leonard Guthrie, *Rep. of the Soc. for the Study of Disease in Children*, vol. iii., 1903, p. 117; G. A. Sutherland, *ibid.* p. 111.

CHAPTER VIII

ON JAUNDICE IN CHILDREN

Apart from icterus neonatorum, jaundice is not very common in childhood, but it is met with from time to time, as a symptom of various very important diseases. In young children it never gives rise to severe itching, nor is it accompanied by marked slowing of the pulse, as in later life.

The chief forms of jaundice in early life are icterus neonatorum, catarrhal jaundice, and those due to infective conditions of the umbilicus and intestine, to congenital syphilitic lesions of the liver and its ducts, to congenital obliteration of the bile-ducts, to gall-stones, and to acute yellow atrophy. Jaundice is also a prominent symptom in various other rare diseases, as in Buhl's disease (fatty degeneration of new-born children), which is a severe form of infective jaundice, in Winckel's disease (epidemic hæmoglobinuria), and in some kinds of hepatic neoplasm.

Icterus Neonatorum (*Physiological Jaundice*)

In new-born children the skin is of a more or less deep red colour all over the body. This gradually fades, leaving in many cases a yellow tinge. When the yellow discoloration is marked, it is spoken of as icterus neonatorum, or physiological jaundice. It is generally noticed first on the second or third day after birth, and is never present when the child is born. After increasing in depth for a day or two, it gradually diminishes, and is usually gone within a week or ten days.

The explanation of this phenomenon is still obscure. It is certain, however, that it is a form of hepatogenous jaundice, and not, as was formerly held by some, hæmatogenous in origin, nor, as others have thought, merely a local discoloration due to the red of the hyperæmic skin turning yellow as a bruise does in the process of fading. It seems probable that at birth a specially large amount of highly pigmented bile is normally secreted, but how this finds its way into the general circulation is still undetermined.

The discoloration differs from that in ordinary obstructive jaundice both in its distribution and in the order of its appearance. It is first seen on the face and chest, later on the sclerotics, and last of all on the hands and feet. Compared with the skin, the sclerotics are slightly affected and they may remain normal in colour, while in ordinary jaundice they are among the parts earliest and most deeply discoloured. The urine also generally remains quite normal in appearance, and the fæces are always so. In other respects the child is perfectly well.

The diagnosis of icterus neonatorum presents no difficulty. The absence of serious symptoms, the slight degree of the jaundice, the normal urine, and the coloured motions suffice to distinguish at once even extreme instances of this condition from cases of infective or catarrhal jaundice, and from those which depend on syphilitic or other disease of the liver or on congenital obliteration of the bile-ducts.

Catarrhal Jaundice

This is fairly common in older children. In infants it is comparatively rare, but it may occur even during the first few weeks of life. It is to be diagnosed by the absence of the special symptoms of the other forms of jaundice in young infants, by the gastric symptoms which accompany it, and by the favourable effect of ordinary soothing treatment.

Jaundice from Umbilical Infection

Infective jaundice is often due to streptococci or other organisms spreading by the umbilical to the portal vein and thence to the liver. Streptococcal inflammations of the pleura, peritoneum, or meninges may also be present.

The **symptoms** are local and general[1]—the former consist in suppuration of the umbilical wound, with redness and swelling of the surrounding skin. The general symptoms, which set in during the first two days of life, are irritability, sleeplessness, refusal of the breast, vomiting, and green diarrhœa. The jaundice increases, and there is more or less cyanosis and sometimes œdema. The temperature reaches 102° to 104° F. Hæmorrhages, which may be fatal, sometimes take place from the umbilicus or bowel. When the general infection is severe, the infant always dies within a few days in a comatose condition.

The **treatment** is mainly prophylactic, and consists in scrupulous attention to aseptic precautions in the management of the umbilical cord.

Jaundice from Intestinal Infection

This is a commoner condition than that which originates in the umbilical wound. It may occur in epidemics or sporadically, and is said to depend on *B. coli* and *B. lacticus*.[2] The bile-ducts are normal and the liver and spleen are little, if at all, enlarged. The intestine shows a slight degree of desquamative enteritis.

The **symptoms** set in rapidly without any apparent cause, the mother being quite healthy. The child refuses the breast, vomits, and may have a slight convulsion. Jaundice, cyanosis, and diarrhœa rapidly set in. The motions are not decolorised. The cyanosis is a very marked feature. It

[1] Porak et Durante, *Arch. de Méd. d. Enf.*, Paris, 1901, iv. p. 321.

[2] Lesage et Demelin, "De l'ictère de nouveau-né," *Rev. de méd.*, 1898, xviii. 1.

usually modifies the yellow tint to a sort of bronze, and may mask it altogether. The diarrhœa is of a peculiar character; it is not severe, and may therefore be overlooked. At first there may only be three or four pale green alkaline or neutral motions in the twenty-four hours; these are passed without pain, and the abdomen remains soft and natural. In fatal cases this condition of the stools continues until death. When recovery sets in, however, the character of the motions changes; they become more frequent (7 to 10), and are bright green in colour and acid in reaction. The general infection gives rise to drowsiness, slight fever, and emaciation. The case lasts from three to twelve days.

The **diagnosis** of this form of infective jaundice depends on the absence of an umbilical lesion, on the lower range of the temperature (not much over 100° F.), and on the absence of other infective lesions such as pleurisy, peritonitis, and meningitis.

The **prognosis** is grave, the mortality being about 30 per cent. Severe cyanosis, high fever, and profound drowsiness are all unfavourable signs. The passage of an increasing number of highly bilious and acid stools is of good omen.

The **treatment** consists in attention to general hygiene, the administration of small doses of calomel, and especially in the use of subcutaneous injections of normal saline solution. Great care must be taken in the disinfection of the motions.

Jaundice from Congenital Syphilis

The common intercellular form of syphilitic cirrhosis in new-born children does not cause jaundice. Occasionally, however, a profound degree of jaundice is met with in syphilitic cases, as the result of pericholangitis, or from obstructive disease of the bile-ducts.[1] In such cases there

[1] Beck, *Prag. med. Wochenschr.*, 1884, ix. pp. 257, 266, 284; H. D. Rolleston, *Brit. Med. Journ.*, 1907, ii. p. 947.

are usually hæmorrhages in some situations, and severe cachexia; and death soon occurs, in spite of antisyphilitic treatment. The only features which distinguish the condition from congenital obliteration of the bile-ducts (which generally has nothing to do with syphilis) are the presence of syphilis in the parents, other indications of syphilis in the child, and its severely cachectic state.

Congenital Obliteration of the Bile-Ducts

Under this heading a series of cases of infantile jaundice are described, in which the bile-ducts and gall-bladder are found to be obstructed in a varying degree, and to show signs of intra-uterine inflammation, while the liver is in a state of "biliary cirrhosis."[1] In these cases there is not infrequently a history of one or more other children in the family having been similarly affected. The patients show no signs of syphilis, but occasionally malformations of other organs are present. The pathology is obscure, and need not be discussed here.

Symptoms.—The jaundice is sometimes present at birth; often, however, it does not appear till the second or third day, and occasionally not till the end of a week or a fortnight. It rapidly becomes intense, and remains so usually for the rest of the child's life, though it may vary a little from day to day. Apart from the discoloration of his skin, the baby seems fairly well. The motions may be colourless from the first, or may only become so after a certain amount of meconium has been passed. The urine is always intensely bile-stained. Umbilical, gastro-intestinal, and subcutaneous hæmorrhages are common. Sooner or later the liver and spleen become considerably enlarged. There is no fever and little or no cachexia.

[1] "Congenital Obliteration of the Bile-Ducts," *Allbutt and Rolleston's System of Medicine*, 1908, vol. iv. pt. i.

The **diagnosis** may present some difficulty at first; but in a few days the deepening jaundice, colourless motions, and deeply bile-stained urine prove that there is something more serious the matter than icterus neonatorum, and the absence of severe cachexia further differentiates the condition from infective and syphilitic disease.

The **prognosis** is, of course, of the utmost gravity; no child proved to have had this complaint has ever lived eleven months. If the infant is not carried off by hæmorrhage during the first week or two, he will probably live for from three to six months.

No **treatment**, medical or surgical, gives any prospect of relief.

Gall-Stones

Gall-stones are extremely rare in childhood.[1] When found in very young infants, they consist of comparatively soft masses of inspissated bile, and are probably merely an incident in the course of congenital obliteration of the bile-ducts.[2]

Acute Yellow Atrophy of the Liver

This is met with occasionally in childhood, and has been described in young infants. In them it runs the usual extremely rapid course, without fever and without signs of sepsis.

[1] Mercat, *De la colique hépatique chez l'enfant*, Thèse de Paris, 1884; Still *Trans. Path. Soc. Lond.*, 1899.

[2] Thomson, *Edin. Hosp. Rep.* v., 1898, p. 1.

CHAPTER IX

ON THE SKIN

The condition of the skin as to colour and moisture, as well as temperature, should be carefully noted, and the presence of any œdema, desquamation, eruption, or other abnormality investigated.

Colour

The chief changes in colour in the skin are jaundice, cyanosis, pallor, and pigmentation.

Jaundice.—The various forms of jaundice have been considered in the last chapter. In forming an opinion as to its cause in any case, we have to take into consideration the age at which it began and how long it has lasted, the depth of the discoloration and the state of the urine and fæces, also whether there have been any hæmorrhages and whether the liver and spleen are enlarged. We must also notice the child's general condition, if fever is present or any other sign of sepsis, and if there is any local lesion at the umbilicus or elsewhere likely to have given rise to blood-poisoning.

Cyanosis.—General cyanosis may be a sign of serious disease of the heart or lungs, either congenital or acquired. When it occurs in an acute illness it is of great importance as indicating failure of the heart or the degree to which the lungs are affected. It is also found in diseases that are characterised by extreme prostration, such as septicæmia and malignant cases of infectious disease. Lividity of the

extremities is frequent in wasting diseases of all kinds, and is especially marked in Raynaud's disease. A bluish tinge round the mouth and eyes is a common sign of dyspepsia in young infants.

Pallor.—The peculiar pallid brownish yellow tinge of the skin which is characteristic of splenic disease sometimes occurs distinctly in children, but in many cases where the spleen is much enlarged it is entirely absent. The sallow, earthy tint of scorbutic infants is often a help in diagnosing their condition. The same may occasionally be said in the case of syphilitic infants.

Pigmentation.—Addison's disease is very rarely met with in childhood, and then almost exclusively in children over twelve. A brown discoloration, especially marked about the axillæ, abdomen, groins, and perineum, is noticeable in cases of chorea and other diseases when arsenic has been given in large doses. Leonard Guthrie has pointed out[1] that pigmentation of the skin is "a most important diagnostic sign of interstitial nephritis in both old and young, although not existing invariably."

Moisture and Dryness

Undue perspiration in young children is generally caused by rickets. It also occurs in empyema, in tuberculosis, and in septic conditions generally.

Profuse sweating is a common symptom of chronic intestinal dyspepsia in nervous children, and has in them no serious significance. It calls for regulation of the diet and for general tonic measures, such as more fresh air, cold douching, and cod liver oil. Small doses of oxide of zinc (grs. i to ii) are also sometimes useful.

An habitually dry, harsh skin is a common accompaniment of chronic digestive derangement, of tuberculous

[1] *Lancet*, Feb. 27, 1897.

conditions, and of cretinism. It occurs also in many cases of obstinate diarrhœa, and if the skin can be excited to normal action this may help greatly towards the improvement of the bowel condition (E. Smith).

Œdema

Marked œdema of the skin generally indicates nephritis, and this is sometimes present even in cases where the urine is free from albumin. The skin may, however, become œdematous in anæmic and wasted babies under various conditions quite apart from kidney disease. Marked dropsy of the lower limbs or of the whole body sometimes occurs in cases of severe diarrhœa with normal urine. The cases in which this takes place are generally serious, but it is not necessarily a fatal sign. Œdema is always prone to occur in weakly and premature babies when anything happens that disturbs the balance of their circulation. It is therefore a common occurrence in those who are being forcibly fed by gavage and in those who are getting too much fluid administered either per rectum or in the form of subcutaneous saline infusions. The presence of chloride of sodium in the food is found greatly to increase the tendency to œdema.

Œdema from heart disease is much less common in children than in adults. Considerable dropsy of the skin may sometimes be left after erysipelas. A slight degree of œdema of the eyelids and extremities is often found associated with urticaria and without any albuminuria. In such cases a history of severe itching will generally be obtainable, even when the characteristic eruption cannot be made out. *Angio-neurotic œdema* occurs sometimes in childhood. Sudden marked swelling of some part, such as the cheek or hand, or the scrotum, occurs and passes off within an hour or two. The condition is an obscure and generally a

trivial one; but should it affect the throat, it may cause fatal œdema glottidis.

Slight œdema of the eyelids is characteristic of the later stages of whooping-cough, when the spasms are severe. In infantile scurvy, œdema of the eyelids and of the hands and feet is a common occurrence. Some local swelling of this kind is also met with in severe tetany and in some cases of purpura.

Œdema Neonatorum.—When a baby is born œdematous, or becomes so immediately after birth, it may be due to congenital nephritis, as in a case reported by Ashby. The great majority of cases, however, are due merely to debility of the circulation. The condition indicates a dangerous degree of weakness. The skin pits on pressure, and the condition is quite different from that in sclerema.

Sclerema Neonatorum.—This is an extremely rare disease, met with almost exclusively in maternity and foundling hospitals. The children may seem normal at birth, but are usually very feeble and often premature. Within a day or two they begin to waste; the temperature falls to below 90° F.—sometimes as low as 84° F.—in the rectum, and the skin becomes hard and thickened. Beginning in the lower limbs, the induration spreads over the trunk, arms, and face, and the whole body may become stiff with it. The surface is of a pale, dirty yellow colour, and cold like that of a cadaver; the extremities are bluish. The thickened parts do not pit on pressure. The children almost always die in three or four days or within two or three weeks at latest.

Pseudo-sclerema.—This name may be given to a condition which is much commoner than true sclerema. It resembles it in the large indurated areas of skin and subcutaneous tissue which it causes in the same parts of the

body. The affected skin does not, however, pit on pressure, but it is reddened, and the child has not the extremely subnormal temperature of true sclerema. The cases usually recover entirely after a month or two. Those I have seen were treated with inunction of mercurial or ichthyol ointment and careful dieting. The condition has more resemblance to an extremely chronic and peculiar form of erysipelas than to true sclerema.

Subcutaneous Emphysema.[1]—This occasionally occurs in little children, in the region of the neck and neighbouring parts, as a consequence of violent coughing. I have seen it in measles, whooping-cough, and bronchitis. It is generally recovered from unless the original condition is serious. The only treatment consists in soothing the cough.

Another cause of subcutaneous emphysema is the puncture, with a large exploring needle, of a lung which is adherent to the chest wall. Unless local pressure is applied at the time, the air may spread over a considerable area of the subcutaneous tissue. This may occasion a slight rise of temperature (about 101° F.) for two or three days, but otherwise does no harm.

Desquamation.—Any peeling of the skin is worthy of attention. If its distribution is general, it should arouse suspicion of scarlet fever. It may, however, also be met with in other diseases, such as enteric and rheumatism. In hospital patients it may sometimes be attributable to the application of soap and water to an unwonted extent. In children suffering from prolonged feverish ailments (*e.g.* tuberculous affections) there is often a general branny desquamation of the epidermis.

When there is desquamation limited to the chest, it is often due to rubefacient applications or poultices. In infants

[1] L. Guillemot, *Grancher and Comby's Traité des Maladies de l'Enfance*, 2 ed. t. iii. p. 498.

of a few months, desquamation of the hands and feet is often due to congenital syphilis.

Eruptions

All skin eruptions are to be investigated as to their distribution, the presence of itchiness, the anatomical character of the lesions, and their cause.

Distribution.—The precise distribution of the eruption is the first point to be ascertained, and this may throw much light on its cause. In early infancy the palms and soles are characteristic sites for syphilitic lesions and also for the eruption of scabies. Eruptions in the neighbourhood of the anus are often due to the irritation of intestinal discharges, and are sometimes specific. Other peculiarities in the distribution of congenital syphilitic lesions will be referred to later (Chap. XXII.).

In infants on the breast, pediculi pubis sometimes find their way on to the eyelashes from the mother's axilla. Small patches of herpes on the face or ear are not uncommon in irritated conditions of the teeth and throat.

Itchiness.—This is a common and distressing symptom. It occurs in urticaria, prurigo, eczema, scabies, dermatitis herpetiformis, and pediculosis, and is sometimes troublesome also in chicken-pox and in the early stages of measles and scarlet fever. It is usually absent in specific rashes. Herpes in childhood is seldom if ever accompanied or followed by severe pain.

Anatomical Characteristics of the Lesions. — In infancy, according to Dr. Radcliffe Crocker, skin eruptions "are more likely to take a pustular form, and from the ease with which the alimentary canal is deranged, there is a greater tendency to eczema or urticaria."

Causation.—In considering the causation of extensive eruptions in young babies, the possibility of congenital

syphilis, scabies, and drug eruptions should never be forgotten. The effect in exciting and aggravating skin eruptions exerted by excessive perspiration, washing with strongly alkaline soaps, imperfect drying of the skin after bathing, and exposure to cold winds, are also important. The influence of teething on eruptions has been already discussed (p. 45). Vaccination, although often unjustly blamed, certainly acts in some cases as an exciting cause of skin eruptions. If performed when a child is suffering from chronic skin eruption, it is apt to aggravate the condition; but in rare cases it may have a beneficial effect upon it.

We shall only deal with a few of the more characteristic skin diseases.

Eczema

Eczema, like many other skin affections, has a much greater tendency to become pustular in children than it has in adults. It is, also, very apt in them to be set up by any local irritation, *e.g.* by scratching, strong soap, irritating discharges, or any form of dirt. It may also be caused or aggravated by reflex irritation from the alimentary tract, including the teeth (p. 45).

The **causation** of infantile eczema, however, like that of eczema in later life, is generally quite obscure—although some predisposing causes are known. We frequently meet with it in gouty families. Sometimes there is a strong family history of eczema or of asthma. Sometimes the patients are notably anæmic, strumous, or underfed. Often, however, it must be admitted, severe typical eczema is met with in splendidly well-nourished and well-grown breast babies whose surroundings can scarcely be found fault with.

The **distribution** varies, but in the majority of cases the face and the scalp are the parts affected. Often the eruption is seen markedly on the cheeks, chin, and forehead, and

behind the ears. The scalp is very frequently affected either alone or with the neighbouring parts. The gluteal and genital regions and the flexures of the limbs are other common sites of the disease.

Impetiginous eczema is often found on the scalp and face, and is very generally due to the presence of pediculi capitis and the scratching which they occasion. It often gives rise to enlargement and even to suppuration of the neighbouring lymphatic glands.

Seborrhœic eczema is common, especially on the scalp and behind the ears, but also elsewhere. It is much more rapidly curable than many other forms of the disease.

Eczema is sometimes complicated by, or alternates with, asthma. Often the patients show various lithæmic symptoms (p. 509). Frequently it is accompanied by gastro-intestinal disturbance, with bronchitis, or with nephritis.

The **prognosis** is generally good. Most cases of eczema recover with careful treatment, but all forms of the disease have a tendency to relapse. Fortunately, in the great majority of cases the disease passes off as the child grows older. The marked improvement which generally follows the cessation of teething has been already alluded to.

In all cases in which the eruption involves a large area of the surface of the body, we must remember the possibility of sudden death occurring with high temperature and convulsions.

Treatment.—This must not be local only. The child's general state must also be carefully treated.

The *diet* must be revised, and any excess or deficiency, either of fat, starch, or proteid, corrected; and plenty of fluid must be given. If constipation exists, it is most important to relieve it by the regular use of Carlsbad salts, or in some other way. Diarrhœa, if present, must be checked.

If the child is anæmic or rachitic, iron, cod liver oil, and tonics are indicated. If he shows signs of lithæmia, that condition should be treated (p. 512).

In a few chronic cases arsenic is valuable. Generally it does no good, and in the acute stages it is very apt to aggravate the inflammation. In acute cases, small doses (♏ i to ii) of antimonial wine are sometimes useful. Chloral may sometimes be given with advantage to secure a good night when the itching is distressing.

The *local treatment* of eczema, however, is generally the most important. The diseased surface must, to begin with, be protected from all irritating influences. The child must be carefully kept out of cold winds. High, bracing places will generally be found bad for him. Prolonged washing with ordinary water and soap should be forbidden. The affected parts must, of course, be kept scrupulously clean and dry, but the bath should be of short duration and carefully given, and oatmeal and water, or bran and water, or normal saline solution, should be used for it. When soap is required, some "over-fatty" variety is to be chosen. After the child has been dried, zinc and starch, or some other simple dusting powder, should be applied. Scratching must, of course, be prevented, if necesssary by mechanical means, such as the application of splints to the arms.

The best local application to use depends on the state of the eruption. In many cases it is advisable to begin with the application of boracic and starch poultices, which soften the scabs and soothe the inflammation. Later, a calamine lotion (F. 12) is often useful. Lassar's paste (F. 13) and white precipitate ointment (grs. v to ℥i), with or without the addition of zinc oxide (℥i to ℥i), are favourite applications. When the skin is very dry, great relief may result from the use of Carron oil.

In more chronic cases with severe itching, the applica-

tion of tar is of great value. It may be used as a lotion (*e.g.* liq. carbonis deterg. ℥i in ℥x of water) or as an ointment (*e.g.* ung. picis ℥i, ung. zinci ad ℥i). If tar in any form is applied extensively, a watch must be kept on the state of the urine, as it may give rise to albuminuria.

In seborrhœic eczema the application of antiseptics such as resorcin ointment (grs. x to ℥i) or of sulphur (*e.g.* sulphur, grs. v to x, ac. tannici ℥i, vaselini ℥i) is generally very efficacious.

Eczema behind the ears generally yields readily to an ointment of bismuth and zinc (āā ℥i to ℥i) or to one containing tannic acid (℥i to ℥i).

Erythema Nodosum

Symptoms.—This is a common condition in childhood, and its well-known red, rounded, slightly raised and tender areas are generally met with on the shins only, although sometimes they occur on the extensor surface of the arms also, and to a much less extent on other parts. The eruption usually lasts two or three weeks, but sometimes has relapses.

It is important to bear in mind that the appearance of the eruption is sometimes preceded and accompanied by a remittent temperature closely resembling that of early enteric. Very considerable disturbance of the general health is sometimes found along with this, even when the eruption itself is relatively slight. Occasionally "rheumatic" joint pains are complained of; hence erythema nodosum was formerly regarded as a manifestation of rheumatism. It is now generally held, however, that erythema nodosum is not really a rheumatic manifestation in the sense that erythema circinatum is, although undoubtedly an eruption indistinguishable from it is sometimes met with in rheumatic patients.

The **treatment** consists in confinement to bed, milk

diet, saline purgatives, salicylate of soda or aspirin if there are joint symptoms, and lead and opium lotion if the eruption is painful.

Erythema Pernio (*Chilblains*)

This is a common affection in delicate children, and also in some who do not seem delicate apart from their sluggish circulation. Bluish red patches appear on the toes, heels, and margins of the soles, also on the fingers and ears. They are tender and cause severe itching and burning, especially when the parts are warm. In neglected cases, and when there is pressure from badly fitting boots, the chilblains are apt to break, and extensive ulceration may occur.

Preventive **treatment** is very important, as, once the chilblains have formed, remedies are only partially successful. Children who are subject to the complaint should be encouraged to take much exercise in the open air, and to accustom themselves to sleep with open windows. Modified cold douching is also useful (Chap. XXIV.). Strong *roomy* boots and warm stockings and gloves are essential. The general health should be attended to. Cod liver oil is indicated and small doses of liq. arsenicalis are said to have a distinctly prophylactive effect.

When the chilblains are unbroken, tincture of iodine may be painted on once daily, or a weak capsicum ointment (capsici ʒss, ol. amygd. ʒii, lanolini ʒvi) rubbed in. When the skin is broken, boric or zinc ointment, alone or with a drachm to the ounce of resin ointment added, may be used.

Enema Rash

The administration of a rectal injection occasionally causes a rash. The main characters of this rash have been described by Dr. Still[1] as follows. It consists of slightly raised bright

[1] *Clin. Soc. Trans. Lond.* vol. xxxii., 1899, p. 11.

red patches of erythema, which are small and rounded at first but afterwards run into blotches. It is commonest in children between 6 and 12 years old.

The distribution of the eruption tends to be symmetrical, and is very characteristic. It is found on the front of the knees, on the extensor surface of the elbows, on the buttocks, and on the face—especially the cheeks and chin. It is never seen on the palms and soles. Occasionally it is preceded by a diffuse scarlatiniform rash which affects the face as well as the body. It is accompanied by little or no itching. The interval between the administration of the enema and the onset of the eruption varies from 2½ to 48 hours (usually 12 to 24), and the rash remains visible from 12 to 72 hours (usually 24 to 48). There is no constitutional disturbance, no rise of temperature, and no enlargement of glands. There is generally no desquamation, but this does occasionally occur. The rash is most apt to follow a first enema, and usually, though not always, soap has been used. There is no treatment necessary.

Urticaria

Ordinary urticaria is often met with in childhood. It is usually connected with digestive disturbances, though the other symptoms of these may not be very prominent. It may, as in adults, be due to taking certain articles of diet; and, occasionally, it is met with during the active stage of rheumatism. Sometimes urticaria sets up very marked œdema; and when this is so, the eruption may be very slight. In unexplained œdema, therefore, it is always well to inquire particularly as to the presence of itching. The form of urticaria which is peculiar to childhood is lichen urticatus, and it is an extremely common affection.

Lichen Urticatus

Symptoms.—This condition differs from ordinary urticaria in being a papular or papulo-vesicular affection. The papule begins as the centre of an urticarial wheal, but the wheal rapidly fades. The papule may be topped by a vesicle, and occasionally large bullæ form. The severity of the itching generally leads to the top of many of the papules being scratched off and replaced by scabs. The eruption is also often complicated by a contagious impetigo spread by the scratching.

The eruption of lichen urticatus is met with chiefly on the extensor surface of the arms and legs, on the loins and buttocks, and on the wrists and hands. The upper part of the face, the genital organs, and the palms and soles are generally free.

The disease is commonest during the summer months and during the first two years of childhood, but it occurs frequently up to the eighth or tenth year. It often lasts for months in spite of all treatment, and it tends to recur. This tendency passes off, however, as the child grows older. It is often attributed to digestive disturbances, but it is generally impossible to be sure that there is any real connection between the two conditions.

The **diagnosis** is generally easy. Occasionally when complicated by impetigo and altered by much scratching, the eruption of lichen urticatus may look like that of scabies in infants. The characteristic burrows are absent, however, and the distribution of the eruption is somewhat different. The bullous variety of lichen urticatus is sometimes mistaken for varicella.

Treatment.—Lichen urticatus is usually a most obstinate and unsatisfactory malady to treat, as we are so ignorant of its exact causation. The main indications are as follows:—

1. Attend to the digestion and general health, avoid all indigestible articles of diet, and keep the bowel right with magnesia and an occasional dose of grey powder and rhubarb. Sometimes ichthyol in one or two minim doses with glycerine and syrup seems to do good.

2. General sedatives are sometimes useful in helping the child to sleep. Bromide and antipyrin may be tried. In lichen urticatum and in chronic relapsing urticaria large doses of quinine are sometimes very useful. A grain and a half for each year of the child's age may be given at bedtime (Eustace Smith).

3. Local applications almost always give some relief, although often it is only slight and temporary. A 2½ p. c. ointment of β naphthol may be used or a calamine lotion (F. 12). Tarry lotions are particularly soothing—*e.g.* glycerin. plumbi acetat., and liq. carbon. deterg. āā ℥ii to water ℥vi (Ashby). They should be followed by dusting with starch powder.

Exfoliative Dermatitis of New-Born Children (*Ritter's Disease*)

This is an obscure and very fatal disease of the skin, which sets in usually within the first week, or at any rate within the first two or three weeks, in apparently healthy children. The face and the "napkin area" are generally markedly affected, but the whole surface of the skin becomes implicated in time. Flaccid pemphigus-like bullæ occasionally appear and extend indefinitely. The adhesion of the epidermis to the underlying parts all over becomes so loosened that the least touch removes it and leaves the red raw-looking corium exposed (Figs. 55 and 56). Fissures form about the mouth and anus. There is no rise of temperature, but the child's general strength is profoundly affected, and he usually dies within a week in a state of exhaustion. A few cases, however, recover.

The condition is believed to be due to a kind of septic infection. It has certainly nothing to do with congenital

FIG. 55.—Exfoliative Dermatitis in child of 13 days.

syphilis, although it is often mistaken for a manifestation of that disease.

Treatment has generally no effect. Escherich recommends the application of linseed oil and lime water in the early stages, and Lassar's paste and zinc powder later.

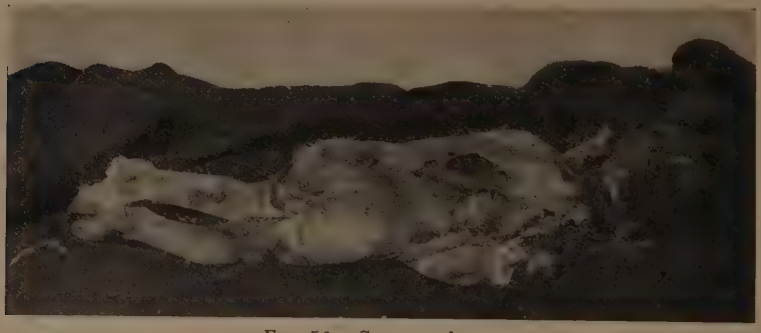


FIG. 56.—Same as above.

GANGRENOUS DERMATITIS (*Varicella Gangrenosa*)

In ill-nourished cachectic children the eruption of varicella sometimes assumes a gangrenous form, and in such children a similar gangrenous dermatitis occasion-

ally sets in apart altogether from chicken-pox. The condition is usually met with in infants. Large rounded ulcerations form with a blackened base (Fig. 57), and these often spread considerably and run into one another. The patients are generally in an extremely exhausted state, and they rarely recover. The *treatment* consists in general stimulant and supporting measures with the application of some antiseptic ointment.

Fig. 57.—Gangrenous Dermatitis.

Boils (*Furunculosis*)

This is generally a disease of cachectic infants, but by no means always. It is due to the action of staphylococcus aureus. The chief peculiarities of boils in infancy are their small size, their large number, and the absence of a core.

The treatment consists in general attention to the nutrition and digestion, including the administration of tonics. Sulphide of calcium (gr. ss. four or five times a day) has been strongly recommended. Local treatment is important. The skin should be thoroughly purified with bichloride of mercury solution (1 to 2000). The boils should be incised when they point, their contents squeezed out, and iodoform

powder applied. When this is done, they heal rapidly in most cases.

Scabies

Symptoms.—Scabies gives rise to more severe visible irritation of the skin in children than it does in adults. Pustulation is readily produced, and urticarial complications are often seen. Impetiginous eruptions are also apt to occur owing to the child's infecting the itching parts by his scratching.

The chief peculiarity of the disease in early life, however, is the distribution of its lesions in young babies. In them the hands are often free, the face and head are affected from contact with the mother's breast, and the buttocks, genitals, legs, and soles from her hands.

The **diagnosis** is sometimes obscured owing to the characteristic lesions being hidden by the results of secondary inflammation. The examination of the mother's hands will generally clear the matter up.

The **treatment** resembles that in adults. The child should have a prolonged hot bath, and be thoroughly scrubbed with soft soap while he is in it. The ointment is then rubbed thoroughly in. This is repeated two or three nights in succession, the ointment being left on during the night and washed off in the morning. If sulphur ointment is used, it must be diluted with equal parts or with twice as much vaseline; and balsam of Peru may be added to it (℥ss to ℥i to ℥i). For infants and for children, when there is much irritation, Kaposi's naphthol ointment (F. 14) is preferable to sulphur ointment. The mother and the rest of the household, if they are infected, must, of course, be treated at the same time as the baby.

CHAPTER X

ON THE TEMPERATURE

Temperature in Health

Taking the Temperature.—In infants, as well as in older children, the temperature is best taken in the rectum; but for ordinary purposes it is more convenient to use the groin or axilla. In young children the groin is preferable; it can be reached with less undressing, and the child feels less uncomfortable sitting with the thigh bent on the abdomen than he does when the arm is held tightly to the side. The thermometer should not be trusted in the mouth in children under four years old, and even at that age only when the child is intelligent and is not agitated.

When the temperature is taken in the rectum, the thermometer must be oiled before insertion, and should be held in place for three or four minutes. When the groin or axilla is used, care must be taken to make sure that the skin is dry. In either the axilla or groin an ordinary thermometer should remain about ten, and a "half minute" thermometer for five minutes. If the skin in either situation is cold to begin with, longer time may be required. In the mouth, five minutes is needed for an ordinary and at least three for a "half minute" thermometer.

The temperature should always be taken in the same place, as the rectal temperature is considerably higher than that in the axilla or groin. According to Demme,[1] the

[1] 14*ten Jahresbericht des Jenner'schen Kinderspital in Bern*, 1877, p. 7.

difference between the rectal and axillary temperatures may be from ·5° to 1·6° F. in normal children, and from ·9° to 1·9° F. in those who are ill.

Normal Temperature.—At birth, the infant's temperature is a few points above that of the mother. In the course of a few hours it falls below normal, but soon rises again. During infancy and childhood the normal temperature is usually said to be a little higher than in adult life; but, according to Dr. Finlayson,[1] the mean temperature is really about the same, only the daily range is greater. This can be seen in the accompanying chart[2] (Fig. 58), which represents

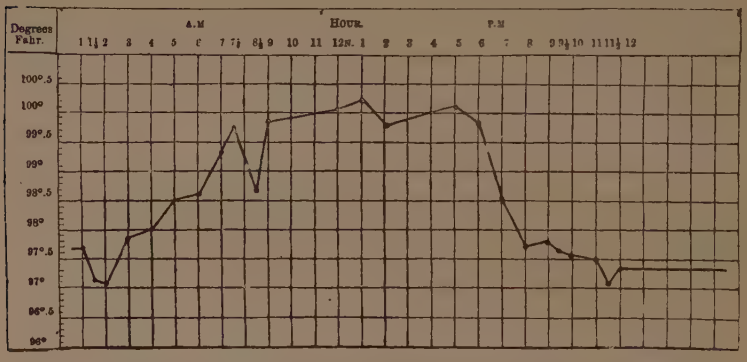


Fig. 58.—Normal Daily Range of Temperature in Children (Finlayson).

the average daily variation of the rectal temperature in eighteen healthy children from 20 months to 10½ years old, who were being kept in bed. The chart also shows the marked evening fall which normally occurs between 6 and 8 p.m. —though sometimes beginning earlier—and the steady rise during the early morning hours. The exact contour of the daily curve varies somewhat with the age of the child[3]

[1] *Keating's Cyclopædia of the Diseases of Children*, vol. i. article "Diagnosis," p. 98.

[2] James Finlayson, "The Normal Temperature in Children," *Glasgow Med. Journ.*, Feb. 1869.

[3] Jundall, *Jahrb. f. Kinderheilk.*, May 1904.

as well as with his times of sleep, the amount of his activity, and other circumstances.

Subnormal Temperature.—During the first three or four months of life there is a great tendency for the temperature to fall very low. In premature and atrophied babies it often remains constantly subnormal—97°, 95° F., or even lower. When this condition is present, a rise of the temperature to 98° or 99° F. may indicate the presence of fever.

Pyrexia

Rise of Temperature.—Young children are more prone to pyrexia from slight causes than adults are, and in them a given cause will produce a higher degree of fever. This, according to Dr. Donkin, is partly to be explained by the relative dryness of the child's skin in feverish conditions. Emotional causes are apt to raise a child's temperature. A certain proportion of children with a normal temperature have some degree of pyrexia during the first night they are in a hospital ward.

Rapid rises of temperature from trivial causes are so common in childhood, that pyrexia alone is not a sufficient reason for anxiety. It is only when it is continuous or goes on recurring that a high temperature becomes a serious symptom.

Sudden Rises of Temperature.—When the temperature of a healthy child *rises suddenly*, the onset of one of the exanthemata or of influenza may be suspected. Careful and repeated examination is to be made for signs of pneumonia. Inspection of the throat is never to be omitted, and otitis is always to be remembered as a possible source of the fever. In many cases the pyrexia will be found to depend on a passing disorder of the stomach or bowel, or to some irritation connected with teething, and under these circumstances an emetic or aperient acts as a rapid antipyretic. Erysipelas and meningitis are other occasional causes of high fever, and

the possible presence of a surgical lesion—especially acute osteomyelitis—is not to be forgotten.

Holt has drawn attention to a type of pyrexia which occurs between the second and fifth days after birth, and which he calls **Inanition Fever**. The temperature may rise to 102° or even 104° F., and there is no other obvious symptom of illness. The fever indicates that the infant is not obtaining a sufficient amount of milk from the breasts, and it disappears within a few hours if the infant is given sufficient milk or water. Comby[1] and others think it probable that the immediate cause of the rise of temperature in these cases is local irritation due to the concentrated urine. A similar condition may occasionally occur in slightly older infants who are suffering from lack of fluid.

Persistent or recurrent rise of temperature without any ascertainable organic cause often gives rise to great perplexity. Such a condition may be due, of course, to tuberculosis in the peritoneum or elsewhere, or to malaria or enteric. Some cases of erythema nodosum also have a temperature curve very like that of mild enteric. The condition of the mouth and throat should always be investigated, as stomatitis and tonsillitis are capable of causing a considerable degree of pyrexia. The examination of the urine too should never be neglected, especially in babies, for both pyelitis and nephritis may be responsible for a very high range of temperature. Unrecognised patches of broncho-pneumonia, and in rheumatic children endocarditis and myocarditis, are also to be remembered as possible causes of fever. Whooping-cough in its early stages is another occasional cause. Many obscure cases of prolonged fever are attributable to the absorption of intestinal toxins.

Some forms of pyrexia seem to be of a purely nervous origin. Recurrent feverish attacks may occasionally be so,

[1] *Arch. de Méd. des Enfants*, II., Oct. 1899, p. 580.

and be comparable, as Ashby suggests, to recurrent vomiting or to migraine. When a child's temperature has been high for some time from any reason, it may continue rising periodically for weeks after the original cause has gone. After severe attacks of whooping-cough and of influenza it is not at all uncommon to find the temperature rising at nights to a considerable degree for many weeks. The pyrexia seems the only symptom; for the child sleeps well, looks well, eats well, and has normal motions. The persistent fever suggests the possible onset of tuberculosis, and may give rise to much anxiety. This kind of fever appears, sometimes at least, to depend on a severe derangement of the heat-regulating nervous apparatus, rather than on a continued infective process. The great majority of the cases end in recovery. They cannot, however, be regarded without anxiety, for after many weeks of severe pyrexia the child's resistance to disease is apt to be dangerously lowered, and the risk of an intercurrent pneumonia is not inconsiderable.

If the cause of the pyrexia in any case remains undiscovered, we must, of course, be guarded in our prognosis. It is, however, a comforting fact that the very great majority of cases, where nothing but pyrexia can be found, end favourably.

Hyperpyrexia.—It is not very rare in babies to meet with hyperpyrexia. It occurs occasionally in many diseases, but is probably most often met with in certain severe cases of intestinal derangement.[1] Its occurrence in these cases has been ascribed[2] to absorption of the toxins of certain non-pathogenic organisms taken in decomposing food. Under such circumstances it is a sign of great danger, as convulsions and coma are apt to ensue, and it calls for prompt and active

[1] Chapin, *Arch. of Pediatr.*, Nov. 1895, p. 917; Milton Miller, *ibid.*, May 1897, p. 347.

[2] Centanni, *Deutsche med. Wochenschr.*, Feb. 22, 1894.

treatment. The stomach should be washed out and a dose of calomel or castor oil given. All fermentable food, and especially all forms of milk, are to be withheld. Stimulants are to be freely given and cold applied to reduce the temperature. Opiates of any kind are to be avoided.

In very young and feeble infants the injudicious application of artificial heat (*e.g.* from hot-water bottles) may cause an alarming rise of temperature. Holt mentions one case in which the temperature rose to 107° F. from this cause. The fact that rheumatic hyperpyrexia is unknown in young children, and very rare indeed in older ones, is referred to elsewhere (p. 505).

Rigors

The occurrence of rigors at the onset of fever is very rare in childhood, and especially so in early infancy. Their place seems sometimes to be taken by convulsions, but it is doubtful whether this occurs as commonly as has often been said.[1] In older children they may be a symptom of many various conditions — such as scarlet fever, enteric, malaria, and pneumonia, and are especially met with in acute septic bone disease and inflammations of the urinary tract.

When rigors occur in infants under two years, they have considerable diagnostic importance, because they are almost always due to the presence of acute pyelitis (p. 211). I have met with them in a marked form in children as young as five and seven months who had this disease.

[1] Baldwin "Rigors in Children," *Lancet*, June 13, 1896, p. 1635.

CHAPTER XI

ON THE URINARY SYSTEM

In the clinical examination of children, few things are more important than the investigation of the urinary tract. Its maladies are not uncommon; they are frequently serious; and they are very easily overlooked. This is especially true in early infancy, because then even acute diseases of these parts may exist without giving rise to any ascertainable localising symptoms, apart from the state of the urine. A knowledge of the condition of the urine is also often essential for prognosis as well as for diagnosis. Even in the matter of treatment it is not without importance, because there are many drugs which should not be given in full doses until we have ascertained that the urine is fairly normal in amount as well as in characters.

The Kidneys

Acute Nephritis—*Causation.*—Scarlet fever is, of course, the most important cause of nephritis in childhood. The discovery of albuminuria should *always*, therefore, suggest an inquiry as to recent complaints of sore throat, etc., as well as a careful examination for traces of desquamation. Nephritis, however, very often occurs quite apart from scarlet fever. Sometimes it is met with as a complication of other infective diseases, such as whooping-cough, measles, diphtheria, erysipelas, chicken-pox, smallpox, mumps, septicæmia, pneumonia, glandular fever, tonsillitis, and gastro-enteric catarrh. It is also quite common as an apparently primary disease.

Symptoms.—Many serious cases begin insidiously with sudden dropsy, but without noticeable subjective symptoms and with little or no fever. In others, there is no dropsy, but the urine is loaded with blood and tube-casts. This is a much less serious type of the disease than the former.

Emmett Holt and others have drawn attention to the peculiar symptoms of acute nephritis in babies under two years. The onset in these cases is sudden, and the most striking symptom is a high, irregularly remittent temperature running up to 104° or 105° F. at nights and lasting for weeks. A certain amount of vomiting and diarrhœa may occur, but there is little or no dropsy. Anæmia is a marked symptom, also restlessness, and sometimes convulsions. The urine is not usually scanty until towards the end. Albumin may sometimes be absent at first, and is never very large in amount. Casts are always present—hyaline, granular, and epithelial — along with pus, epithelial cells, and blood corpuscles. If the symptoms are severe, the condition is always fatal, but slight cases may probably sometimes recover.

The *treatment* of acute nephritis in childhood is in no way peculiar. The patient is to be put between blankets and to be kept on milk and barley water. His skin must be made to act freely by the use of warm baths, hot packs, and hot air baths. With the same object, liquor ammoniæ acetatis or, in bad cases, pilocarpine (gr. $\frac{1}{15}$ to $\frac{1}{4}$, according to age, by the mouth) may be given. The action of the kidneys is to be encouraged by alkaline diuretics and by giving fluids freely. The administration of large saline enemata is also useful in this way. Poultices (plain or mustard) over the loins are also indicated. The bowels are to be kept freely open by saline purgatives and by occasional doses of calomel.

Interstitial Nephritis.—This disease is rare in childhood, but may occur even in young infants. Its main

symptoms[1] are increased arterial tension with cardiac hypertrophy, polyuria,—the urine containing a small amount of albumin and some casts,—excessive thirst, and continued loss of weight. Œdema is rare until towards the end. Uræmia is the commonest cause of death.

Uræmia.—This is a relatively uncommon occurrence in young children. It occasionally gives rise to symptoms very like those of tuberculous meningitis. It is to be treated in the usual way, by purgatives and hot air baths, and by dry or wet cupping, leeches or venesection. When convulsions occur, chloroform or chloral may be given, or even a hypodermic injection of morphine.

Tumours in the Kidney Region.—These are generally sarcomata or adenomata. They are commonest in early childhood, being rare after six years old. They usually cause few, if any, subjective symptoms. When recognised early, a surgical operation may be permissible; but very few cases are on record in which the tumour did not recur.

Hydronephrosis.—This may be congenital or acquired. In congenital cases it is often bilateral, in which case the child generally dies early. When unilateral it may cause little interference with the general health, though it may grow to a large size. It is to be treated by excision of the affected kidney.

Renal Tuberculosis.—Although renal tuberculosis is common in young children, it is very rare to find it sufficiently advanced to cause symptoms. When it does show itself it is generally by severe bladder symptoms and by the presence of pus and blood. Tubercle bacilli in the urine are often very difficult to demonstrate.

The Bladder

In young children the bladder is situated so high that it is practically an abdominal rather than a pelvic organ.

[1] James E. H. Sawyer, *Birmingham Med. Rev.*, Aug. and Sept. 1903.

Special care must *always*, therefore, be taken to see that it is empty before tapping the abdomen.

Micturition.—The infant may pass water soon after birth, as urine is secreted during the later months of intra-uterine life. Not infrequently, however, no urine is passed during the first twenty-four hours or even longer. During the early months of infancy incontinence is the normal condition.

In the first two years (according to Holt) the child generally passes water as often as twice every hour while awake, and during sleep his urine is retained for from two to six hours. By the third year the urine may be held during sleep for eight or nine hours, and at other times for two or three hours. The intervals between micturition steadily increase as the child grows older. Some infants have acquired a certain control over their bladder by the time they are eighteen months or even a year old. In others this comes considerably later. Much depends on the training the children receive. If a child cannot control his bladder to a considerable extent, during his waking hours, by the time he has reached his third year he may be regarded as suffering from incontinence.

Retention of Urine.—Retention is not a very common symptom in childhood. It may be caused mechanically by a calculus impacted in the urethra, and is often due to phimosis. It may also arise from irritation of the rectum by thread-worms or from an anal fissure. It is sometimes met with in enteric fever and in meningitis, and it occurs occasionally as a hysterical symptom. I have seen a marked instance of this in a little girl of $6\frac{1}{2}$ years.

Incontinence of Urine.—Enuresis is a common and important symptom in early life. It is met with in many forms of mental defect and of organic nervous disease; rarely it is a symptom of nocturnal epilepsy or of diabetes. When

it has existed continuously from birth, some local malformation should always be suspected, if the patient is a girl.

In the great majority of cases, however, incontinence of urine is a neurosis depending partly on irritation or slight local disease of the urinary organs or in their neighbourhood, and partly on a weak condition of the child's nervous system, or on a certain mental flabbiness and lack of self-control. It generally occurs in flabby and nervous, or in highly emotional, children; it is especially common among the upper classes, and the tendency to it may be to some extent hereditary.

Great differences of opinion exist as to how often local causes are present, and to what extent they are necessary to the production of the malady. It is certain that many such causes are frequently found, and that their cure will often stop the enuresis at once. It is equally true that the same conditions often exist in other children without causing any incontinence of urine.

Among the more important local causes are latent non-purulent mucous cystitis,[1] which is not very rare, and irritation of the bladder and urethra due to concentrated ammoniacal urine, to phosphaturia, or to excess of uric acid. The presence of a vesical calculus may cause it. Extreme phimosis, with the persistence of adhesions and the consequent retention of smegma, is sometimes to blame; and a narrowing of the meatus is another possible cause. Rectal irritation, as from thread-worms, is also to be remembered.

Chills from any cause are important, probably because they favour the occurrence of mucous catarrh (E. Smith); and there is always a tendency to relapse during the cold and wet seasons of the year. Any influences which tend to cause restless sleep—such as emotional excitement before

[1] J. G. Rey, *Berlin. klin. Wochenschr.* No. 35, Aug. 29, 1904.

going to rest, too warm coverings in bed, or the presence of adenoid growths in the naso-pharynx—have a predisposing influence.

In some cases there is more or less inability to retain the urine during the day as well as at night, and, rarely, the condition may be altogether or chiefly diurnal. In most cases, however, micturition is normal or merely too frequent during the daytime, and the incontinence is nocturnal only. In some cases we have a history of continuous incontinence from early infancy; but generally the child has been normal in this respect for months or years before the incontinence returned.

In commencing the *treatment*, obvious local disease or general weakness must first be dealt with, and the urine carefully examined. If there is cystitis from bacillus coli, the urine should be made alkaline on passing and kept so for some time. At the same time a milk diet should be ordered, and salol given in fairly large doses. If the urine is concentrated and ammoniacal, diluents, milk diet, and salol or urotropin are indicated. Phosphaturia indicates a mainly meat diet, and excess of uric acid suggests alkalies and a diet of farinacea and milk.

A narrow meatus requires dilatation by bougies, while phimosis and the accumulation of smegma call for separation of adhesions and stretching, and sometimes for circumcision.

The influence of chills in causing, and especially in prolonging, the habit of enuresis is not to be forgotten. A cold douche is sometimes very beneficial in toning up the system. Its administration must, however, be so arranged that the child is not chilled by too long exposure during the process (E. Smith). For the same reason the child should be warmly clad, especially about the legs and pelvis. When a boy has a tendency to bed-wetting, it is well to encourage him to practise holding his water as long as he can during the day.

In most cases the amount of fluid in the child's diet should be strictly limited, and he should not be allowed to drink after 5 or 6 p.m. He should be roused to empty his bladder about 11 or 12 at night.

When no obvious indication for special treatment is given by any general or local condition of the patient—and this is very frequently the case—we must have recourse to drugs which act on the nervous mechanism of the bladder. The involuntary passing of urine may, theoretically, be due either to increased irritability of the bladder or to diminished tone of the sphincter. Hence different remedies suit different cases. Which part of the mechanism of micturition is at fault in any case can generally, however, only be suspected after watching the results of treatment.

In the great majority of cases more benefit is obtained from sedatives than from stimulant and tonic remedies alone, and the drugs of most value are belladonna and atropine. These should be given in sufficiently large doses to dilate the pupils and render the throat somewhat dry at bedtime. For this purpose 10 to 15 mins. of the tincture of belladonna may be given at night to a child of four or five years. An older child may have 15 to 20 mins. in the afternoon and again at bedtime. If this is not enough, the dose may be gradually doubled. A solution of atropine is sometimes preferred to belladonna as being less variable in strength. Dr. Holt recommends a solution of one grain to two ounces of water. He begins with 5 mins. of this in the afternoon and evening for a child of five years, and gradually increases the dose to 10 mins. The medicine should be continued for some time after the enuresis ceases, and then gradually be diminished in amount. The addition of bromide to the atropine is often very useful.

In cases where belladonna fails, we may try cantharides in the form of a blister over the sacrum, or give one or two

minims of the tincture thrice daily. Liquid extract of ergot (20 to 30 mins. thrice daily) is sometimes very effectual. Liquor strychninæ also in small doses (2 to 5 mins.) is often of value, and it may advantageously be given with belladonna in many cases. Liquid extract of rhus aromatica (10 to 30 mins. thrice daily) is another well-established remedy. It often aggravates the symptoms at first, and requires to be persevered with for many weeks. Of epidural and of retro-rectal saline injections I have had no experience.

Punishment for bed-wetting has usually only a prejudicial effect, especially in young children. If older children, however, can be stimulated, either by hope of reward or otherwise, to desire strongly to recover from the habit, there can be no doubt whatever that this exerts a powerful effect in favouring their recovery.

Dysuria.—The urinary passages are very tender in little children, and concentrated urine or uric acid crystals may in passing give rise to much obscure local pain, as well as to great general disturbance and distress. This is to be watched for in cases of pyrexia, especially in babies. When recognised, it can often be rapidly relieved by diluents and alkalies. In boys, pain in passing water is often associated with phimosis and preputial adhesions, and disappears when these conditions are attended to. Spasmodic dysuria arises, reflexly, not very rarely, from rectal irritation; I have seen it occur as the first symptom of the onset of tuberculous meningitis. Painful and frequent micturition may, of course, be due to vesical calculus, and in older children these symptoms may accompany renal tuberculosis.

A severe spasmodic form of dysuria is sometimes met with in little girls. The child has an urgent desire to pass water, and screams with pain when she tries to do so. This ailment can usually be speedily relieved by administering

hyoscyamus and potash, or an opiate, and by giving diluent drinks and a hot hip bath.

Renal Colic.—Distinct renal colic with the passage of uric acid crystals occurs occasionally in infants—especially in those of gouty parents.[1] It is often accompanied by a considerable rise of temperature, obviously severe pain, general tenderness, special pain on pressure over the region of the affected kidney, and retraction of the testicle on the same side. It requires diluents along with alkalies and dietetic treatment.

The Urine

Its Collection.—In infants it is always difficult and troublesome to collect the urine for examination. Its amount, colour, and odour may be judged of, to a certain extent, from the napkins, and we sometimes find on them crystals of uric acid which look like grains of red sand. In all obscure cases, however, it is extremely important to obtain a proper specimen for microscopical as well as chemical examination. There are various ways of getting this. One plan—which is perhaps the least satisfactory—is to leave in contact with the genital organs a piece of absorbent cotton-wool which can be afterwards squeezed out into a glass. A simple device—which sometimes succeeds—consists in getting the nurse to waken the child from sleep and at the same time to exert steady pressure over the bladder. In the case of boys, a test-tube or bottle may be so fixed that any urine passed will find its way into it. E. Grossmann[2] has recently described little glass funnels for this purpose, of different shapes for the two sexes. These are applied over the penis or vulva by means of sticking-plaster, and conduct the urine through a rubber

[1] R. A. Gibbons, "Renal Colic in Infants," *Med. Chir. Soc. Trans. London*, vol. lxxix. 1896.

[2] *Münch. med. Wochenschr.* No. 50, 1904. These can be obtained in Edinburgh from Mr. A. Frazer, 22 Teviot Place.

tube to a vessel elsewhere in the bed. I have found these to work very well in many cases. If other means fail, a soft catheter should be passed.

Specific Gravity.—In young infants, after the first two days of life the sp. gr. is often very low (1002 to 1004). It gradually increases with age, and in older children may be found under normal conditions as high as 1025 or 1030.

Reaction.—In children the urine is generally faintly acid. In young infants it often has, however, a strong tendency to turn alkaline soon after it is passed. Marked acidity generally signifies some digestive or other disorder.

Quantity.—The daily amount of the urine in children varies considerably in different individuals, and also on different days, according to the quantity of fluid taken and the amount got rid of by the skin and bowel. The following table (Holt) represents a summary of the results obtained by Schubanowa, Cruse, Camerer, Pollak, Martin-Ruge, Berti, Schiff, and Herter:—

AVERAGE DAILY QUANTITY OF URINE IN HEALTH.

Age.	Grammes.	Ounces.
First twenty-four hours	0 to 60	0 to 2
Second twenty-four hours	10 ,, 90	½ ,, 3
Three to six days	90 ,, 250	3 ,, 8
Seven days to two months	150 ,, 400	5 ,, 13
Two to six months	210 ,, 500	7 ,, 16
Six months to two years	250 ,, 600	8 ,, 20
Two to five years	500 ,, 800	16 ,, 26
Five to eight years	600 ,, 1200	20 ,, 40
Eight to fourteen years	1000 ,, 1500	32 ,, 48

Goodhart and Still[1] have found the daily amount of urine passed by children over two years to be much less than is represented by these figures. They say that, for practical purposes, the average daily amount in ounces, between three

[1] *Diseases of Children*, 7th ed. London, 1902, p. 454.

and twelve years, may be arrived at with sufficient accuracy by multiplying the child's age by $2\frac{1}{2}$. Similar small amounts have been observed by Churchill.

A diminution in the quantity of urine passed may be very important as an indication that the baby is not taking enough milk, or not retaining it, as in the case of chronic vomiting. It is also seen in severe diarrhœa. Suppression of urine may sometimes be caused by certain drugs (*e.g.* antipyrine) as well as by acute nephritis. Increase in the amount passed is seen during the absorption of pleural and peritoneal effusions, and in diabetes and polyuria (p. 215).

Urea.—The daily amount of urea passed amounts, in children from three to five years old, to 13 or 14 grammes, and in those from five to thirteen years, to from 16 to 21 grammes (Holt).

Uric Acid.—The proportion of uric acid in the urine is much greater in new-born children than at any later period of life, and their kidneys often show an accumulation of crystals (uric acid infarcts) in the straight tubules. These crystals are usually washed out within the first few weeks of birth, and may be seen on the infant's napkins; their passage is at times a cause of dysuria and of albuminuria.

Phosphaturia.—Large quantities of triple phosphate crystals are sometimes found in children's urine. This is said sometimes to cause enuresis (Rey). I have seen it accompanied by severe dysuria in a little girl of four years old.

Albuminuria.—The occurrence of albuminuria under many conditions apart from nephritis or pyuria is characteristic of childhood, and its presence is often of small importance. Generally, the presence of a small amount of albumin need cause no anxiety, provided the child seems otherwise well and there are none but hyaline casts, a normal specific gravity, and no cardiac enlargement. Albuminuria is sometimes set up by the application of tarry

preparations or carbolic acid to the skin, or by the internal use of certain drugs — such as chlorate of potash, antipyrin, and arsenic — in large doses. It is met with also in some cases of dyspepsia, and in some children it follows over-indulgence in butcher meat. Sometimes it is distinctly a lithæmic symptom, especially in young infants, and is often found in new-born children along with the passage of large quantities of uric acid crystals. In these cases, as Rachford points out,[1] it is to be regarded as a danger-signal, because it indicates an amount of irritation of the kidney which, if allowed to persist indefinitely, may be expected to end in chronic renal disease.

Orthostatic or Cyclic Albuminuria.—In older children (after seven years) and in adolescents, orthostatic albuminuria is always to be kept in mind. This is a form of functional albuminuria in which the albumin only appears when the patient is in the erect posture. On the child's getting up in the morning the urine is quite normal. Within an hour or two of his rising, however, a considerable amount of albumin is found. This diminishes in amount during the day, and by evening is almost or quite gone. So long as the child is kept lying in bed, the urine remains free from albumin. No tube-casts, other than hyaline, are to be found.

The patients are generally delicate, nervous children, who often have indications of chronic intestinal indigestion. They are listless and headachy, and have cold extremities. There is no enlargement of the heart, and generally no increase of pulse tension. Sutherland[2] found one or both kidneys movable in no fewer than fifteen out of forty cases.

The *prognosis* in this condition is fairly good, but must be guarded. In many cases the albuminuria ceases between the fifteenth and twentieth year; but the general delicacy, of which it is a symptom, may continue long after. In some cases the

[1] *Arch. of Pediatrics*, Aug. 1898.
[2] *American Journ. of Med. Sci.*, Aug. 1903.

condition has succeeded an apparently cured nephritis; and in many individual cases it is difficult to be quite certain that the kidneys are not diseased to some degree. We must remember that in slight cases of nephritis the amount of albumin sometimes varies markedly under the influence of posture.

The *treatment* of cyclic albuminuria consists mainly in attention to the general health. No medicine, no alteration in the diet, and no amount of rest has any distinct effect on the duration of the disease.

Hæmoglobinuria.—Paroxysmal hæmoglobinuria is not very rare in children, and the cases do not differ much from those in adults. Hæmoglobinuria is sometimes met with as a symptom of Raynaud's disease.

Hæmaturia.—This is a common, and always an important and interesting, symptom in childhood. It is met with under a great variety of conditions.

In young babies who are passing uric acid crystals there is often a small amount of blood in the water. This also occurs in infantile scurvy; and the presence of red blood corpuscles, in the urine of cases that are doubtfully scorbutic, forms very important evidence in favour of the diagnosis of this disease. Scorbutic hæmaturia is sometimes met with apart from any other marked symptom of the disease. In cases of renal tumour, hæmaturia generally occurs sooner or later. Blood in the urine is also characteristic of many other diseases, such as acute nephritis, cystitis, purpura, hæmophilia, calculus, genito-urinary tuberculosis, bilharzia, malaria, and some other tropical diseases. It is also sometimes found as a symptom of the irritation which follows the use of cantharides blisters in young children, and it may be caused in some children even by the external application of carbolic acid. In young babies the sudden occurrence of profuse hæmaturia is sometimes due to thrombosis of the renal veins.

Rarely, a child is met with who has more or less constant hæmaturia, dating from early infancy, without any discoverable cause. There seems in these cases to be some sort of congenital local abnormality of the blood vessels. The children are otherwise healthy, and the hæmaturia is not materially influenced by medicine or by hygienic treatment. A curious family variety of this condition has been described by Dr. Leonard Guthrie.[1]

Pyuria.—Pus in the urine in girls may come from a vulvar or vaginal discharge. In older children it may, though rarely, be due to renal tuberculosis. Occasionally in infants it is a symptom of congenital hydronephrosis. In the vast majority of cases, however, pyuria in young children indicates the presence of cystitis or pyelitis.

Cystitis.—This may be of a simple catarrhal variety, or it may be due to a growth of bacillus coli either pure or as a mixed infection.

Simple catarrhal cystitis, due to concentrated or ammoniacal urine or to chills, sometimes occurs in young children. It is rather commoner in boys than in girls, and it is sometimes important as a cause of persistent incontinence of urine.[2] The symptoms are often extremely slight; and the microscopical examination of the urine shows only mucus corpuscles, some epithelial cells, and a few leucocytes. The treatment consists in regulation of the diet, the administration of salol, and the careful avoidance of chills.

Cystitis from mixed infection is characterised by alkaline urine. It is much less common and much more troublesome than the form due to B. coli alone. Urotropin internally (grs. ii to x for a dose, according to age) forms the best treatment, and salol is also useful. In bad cases, washing out of the bladder may be necessary.

[1] *Lancet*, May 3, 1903, p. 1243.
[2] J. G. Rey, *Berlin. klin. Wochenschr.*, Aug. 29, 1904.

Cystitis due to bacillus coli is not uncommon, especially in little girls. It is sometimes met with alone, and often as a complication of gastro-intestinal disease. It may give rise to dysuria and frequent micturition, but often causes no very noticeable subjective symptoms. The child's temperature may be raised to 100° or 101° F. The freshly passed urine is markedly acid, and contains masses of the organism along with pus cells. It often has a heavy, unpleasant odour, and sometimes it is fetid. The pus is not usually, however, very copious, and sometimes it is very small in amount. The treatment is the same as that for pyelitis (see below). If the condition is severe, the child should be kept on milk diet. Washing out of the bladder is not called for.

Acute Pyelitis.—There is an interesting disease met with, usually in early infancy, which is believed to be due to the infection of the upper urinary passages by B. coli. Although its exact locality may not as yet be proved beyond dispute, the disease is probably of the nature of pyelitis.[1] It is almost always confined to the female sex, and is much commoner during the first two years than later in life. It is an alarming illness, easily diagnosed if thought of, but otherwise very apt to pass unrecognised.

Symptoms.—The onset is generally sudden. The temperature runs up to 103°, 104°, or higher, and assumes a remittent type, the chart often looking very like one of enteric fever (see Figs. 59 and 60). Along with the rise of the temperature, more or less marked rigors often occur. I have met with them eight times in fifteen cases, although all the patients were under two years (see p. 196). The children may become drowsy and delirious, and if so, their eyes often deviate. On this account cerebral mischief is apt to be suspected. Sometimes the breathing is quickened. Another

[1] Emmett Holt, *Archives of Pediatrics*, Nov. 1894 ; John Thomson, *Scot. Med. and Surg. Journ.*, July 1902.

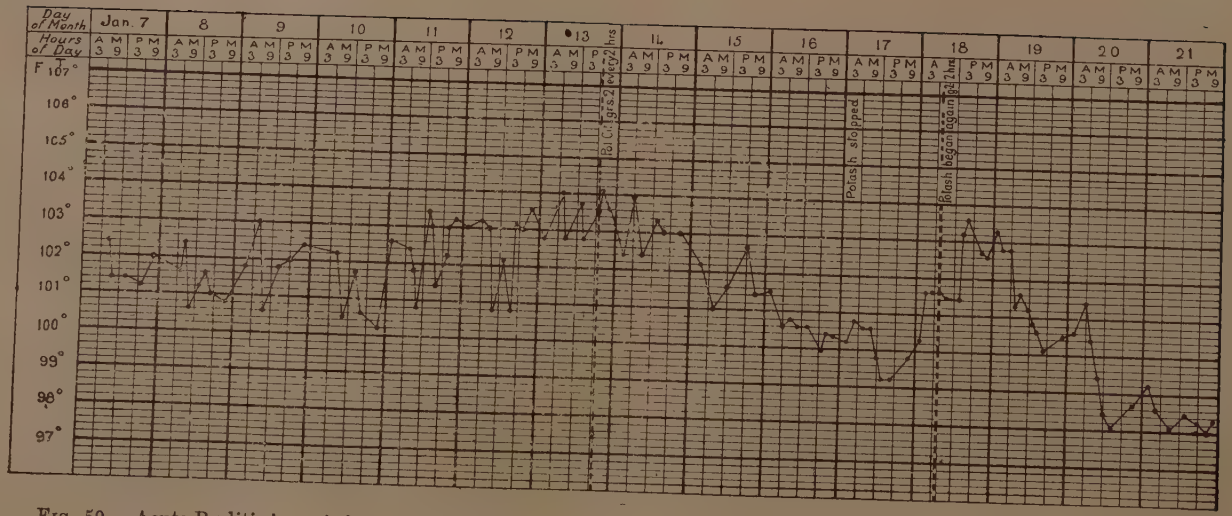
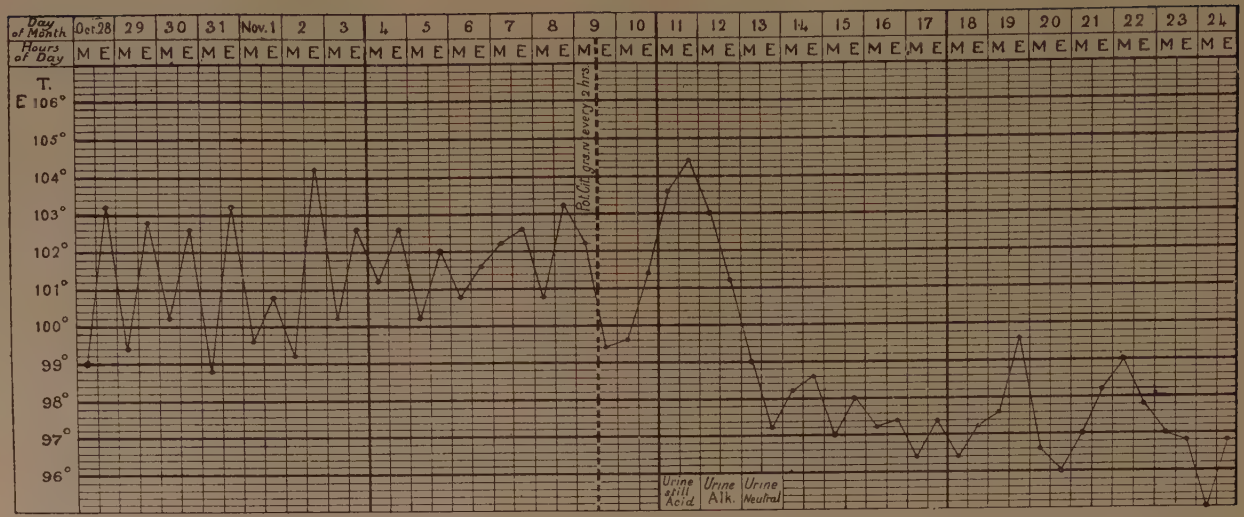


FIG. 59.—Acute Pyelitis in an infant aged 10 months. The chart shows the effect of intermitting the potash treatment.


Day of Month
Oct. 28 29 30 31 Nov. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hours of Day
M E M E M E

most characteristic feature of these cases is the *restlessness* and *obvious misery* which are constantly present. The infants sometimes take their food very well, sometimes very badly. They are generally constipated.

Local symptoms in connection with the genito-urinary tract are generally slight or altogether wanting. There may be spasms of colic-like pain or dysuria, or tenderness over one or both kidneys. Often there is a history of an anal fissure or excoriation.

The urine is acid when passed, sometimes extremely so, and there is a small amount of albumin—accounted for by the presence of pus cells. These may not be very numerous. Clumps of bacteria are always visible under the microscope in large numbers in the freshly passed urine, and cultures generally give a pure growth of B. coli. It is to be noted, however, that at the very beginning of the attack no pus cells are discoverable.

The main and the only essential *treatment* consists in *rendering the urine neutral, when passed,*[1] *by the administration of alkaline remedies* as speedily as possible, and in *keeping it so until all the symptoms have disappeared.* When this indication is thoroughly carried out, its good results are very remarkable. The pain and uneasiness rapidly vanish, and the temperature falls to normal within three days (see Fig. 60). The pus cells also disappear. The bacteria, however, may persist for a long time after the pus has gone; but they seem to do no harm.

To render the urine alkaline, citrate of potash may be given in doses of 48 to 60 grains, or more, in the twenty-four hours. Liq. potassæ also does well. If the bowels are constipated, ordinary phosphate of soda is probably the best laxative to use, as it assists in the alkalinisation of the urine

[1] As the urine tends rapidly to become alkaline on keeping, it is essential, in order to avoid error, that it be examined immediately after it is passed.

(R. Hutchison). Occasional doses of calomel are advisable. The alkaline treatment must be continued for a week or two at least, in spite of the depressing effect which it has on the child's general condition and the loss of appetite which it is apt to occasion. If it is stopped too soon, the symptoms return (Fig. 59). Salol, in doses of gr. i to ii every four to six hours, is sometimes useful. I have never seen much benefit from the use of urotropin in this affection. Sedatives and antipyretics are not needed.

If untreated, or inefficiently treated, the malady lasts for a long time and produces very great distress and debility.

Glycosuria.—Sugar is rarely found in the urine in children; with care, however, its presence in minute quantities may be demonstrated frequently, and this is of no clinical importance. When it occurs in any considerable amount, its presence is always of very grave significance, as it indicates diabetes.

Diabetes Mellitus.—This disease may occur at any age, from a few days old upwards. Fortunately, however, it is not common in children. The symptoms in them are similar to but more severe than those in adult life. If much sugar is present, the patient generally dies in a few weeks or months. Incontinence is often the first symptom noticed. *Treatment* by drugs has no effect, and any attempt at strict dieting is useless cruelty. The *prognosis* is very bad; young children never recover, and older ones scarcely ever.

Diabetes Insipidus (*Polyuria*).—This rare and interesting disease occurs occasionally in a very marked form in children. The symptoms and course are as in adults. The prognosis is much less serious than that of diabetes mellitus, as many cases recover. The treatment consists mainly in attention to the general health. Great care must be taken to avoid chills and over-exertion, and to encourage the action of the skin (warm clothing and warm baths).

The benefit to be derived from medicines is doubtful. Cod liver oil is indicated. Improvement has sometimes followed the use of ergot and antipyrin. In one patient, a healthy-looking boy of two years, whose symptoms had lasted for several weeks, and who was passing seven or eight pints of urine daily, the continued administration of ergot was accompanied by gradual improvement. Two years later he was reported to be quite well in every respect.

Vulvo-vaginitis.—Blennorrhœal discharges may be simply catarrhal, arising from such causes as dirt, friction, oxyurides, or the contact of irritating urine or fæces; or they may be gonorrhœal. The gonorrhœal variety is very often acquired accidentally from contact with infected bed-clothes, sponges, etc. It is very apt to spread in a ward[1] unless great care is taken. Gonorrhœal rheumatism occasionally follows.

The *treatment* of either form consists, if the case be severe, in keeping in bed, in attention to the general health, and in the use of antiseptic lotions. For the latter purpose nothing is better than injections, frequently repeated, of a lotion of boracic acid (saturated solution) or perchloride of mercury (1 to 10,000) or protargol (1 per cent.). A weak mercurial ointment may also be used with advantage, and a pad of sterilised wool kept over the parts lessens the risk of further infection. The condition is one which often resists the most careful treatment for a long time.

Phimosis.—Young babies have normally an adherent prepuce with a narrow opening. Only when the adhesion persists too long, or masses of smegma are retained, or the opening is so small as to interfere with the free passage of urine, is the condition abnormal and treatment required.

When marked phimosis or adhesions are present, great general as well as local disturbance may ensue. The child becomes restless and irritable, and sleeps badly. He cries

[1] L. Emmett Holt, *New York Med. Journ.*, March 18 and 25, 1905.

before micturition, and his penis is often erected. The *treatment* consists, of course, in circumcision. Simple separation of the adhesions and stretching of the foreskin will sometimes suffice. If the patient, however, is nervous and irritable, circumcision is generally advisable.

CHAPTER XII

ON SOME DISEASES OF THE BLOOD AND BLOOD-FORMING ORGANS [1]

The Blood in Infancy and Childhood

During the first four years or so of life the child's blood differs from that of the adult in various ways.

At birth the blood is very concentrated, the hæmocytes

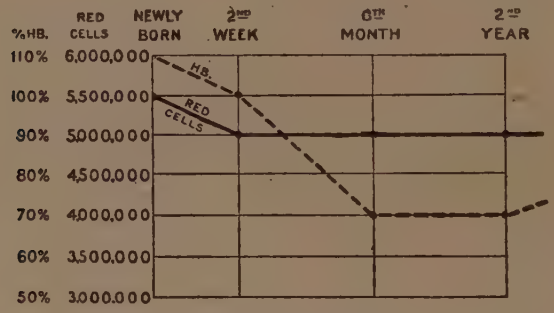


Fig. 61.—Proportion of hæmoglobin and red corpuscles throughout infancy (R. Hutchison).

averaging 5,500,000 and the total leucocytes 20,000 in the cubic millimetre, while the hæmoglobin is about 110 per cent. At this stage the red corpuscles show a tendency to an inequality in size, and during the first few days some nucleated red cells are normally present. Among

[1] In the preparation of this chapter the author has made much use of Dr. J. S. Fowler's papers, "On the Diagnosis and Prognosis of some Forms of Blood Disease in Infancy," *Internat. Clinics*, 1901, and "On the Splenic Anæmia of Infancy," *Brit. Med. Journ.*, Sept. 6, 1902; and of Dr. Robert Hutchison's Goulstonian Lectures, *Lancet*, March 7, 14, and 21, 1904.

the leucocytes, polynuclear forms predominate, and the lymphocytes are relatively few in number.

This state of things does not last long (Fig. 61). Within the first fortnight the number of the hæmocytes falls to 5,000,000 in the cubic millimetre, at which figure it remains through life. The number of the total leucocytes diminishes until it reaches 10,000 per cubic millimetre at the end of the first week, and then rises again steadily to 15,000 by the end of the sixth month. The proportion of the hæmoglobin falls steadily until it is only about 70 per cent. at

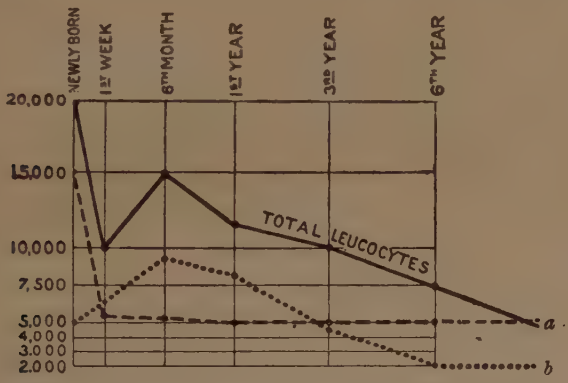


FIG. 62.—Absolute number of leucocytes per cubic millimetre at different ages. *a*, Polynuclears. *b*. Lymphocytes (R. Hutchison).

the end of the sixth month. It then remains stationary for about eighteen months, and after that rises slowly and gains the normal level about the sixth year. The proportions of the different forms of leucocyte also change. During the first week of life the polynuclears rapidly diminish and the lymphocytes gradually increase in number (Fig. 62).

We see from the above that the main peculiarities in the blood of little children are the high absolute number of non-granular leucocytes and the relatively low percentage of hæmoglobin.

Leucocytosis

In childhood, as in later life, the condition of the blood as to leucocytosis is sometimes of great assistance in the diagnosis of septic and inflammatory states as well as in blood diseases. It is also of some value in prognosis under certain circumstances.

In some diseases—namely, tuberculosis, influenza, mumps, measles, rötheln, enteric, and malaria—there is usually no increase of the leucocytes in uncomplicated cases. In tuberculous meningitis, however, there may be considerable leucocytosis. In practically all the other infective diseases there is a marked polynuclear leucocytosis. This is characteristic, for example, of diphtheria, scarlet fever, erysipelas, whooping-cough, acute pneumonia, empyema, purulent meningitis, suppurative appendicitis, tonsillitis, pharyngitis, cystitis, pyelitis, nephritis, gastro-enteritis, peritonitis, endocarditis, pericarditis, acute rheumatism, osteomyelitis, and septicæmia—also of severe rickets and of various neoplasms. The leucocytosis of whooping-cough may be very valuable in the diagnosis of obscure cases.

The leucocyte count may be of considerable value in many cases of obscure diagnosis. It may help us, for example, in differentiating a case of typhoid from one of appendicitis, septicæmia, or purulent meningitis, or an appendicitis from renal colic, acute indigestion, or typhoid.

The fact of leucocytosis not occurring in a case of one of the infective diseases in which it is usually found, may be due either to the attack being a slight one or to the patient having a very low vitality. In the latter case it implies a very grave prognosis. On the other hand, in a severe attack of pneumonia a high degree of leucocytosis is of good omen.

Anæmia

Anæmia is common in children, but as a symptom calling for direct treatment it is much less frequently met with in them than in adults. The majority of pale, feeble-looking children are not benefited by the use of iron, and many of them are made worse by it. Their pallor is largely a vaso-motor phenomenon due to dyspepsia; and, as the iron tends further to derange the digestion, it does them more harm than good. Delicate children who have been taking Parrish's Syrup or some other chalybeate preparation for months without improvement, generally gain at once in appetite, colour, and brightness if the iron is changed for an ordinary alkaline and bitter tonic. In some cases of anæmia and dyspepsia, however, the indigestion is secondary to the state of the blood. In these, and in cases of anæmia where the digestion is not impaired, iron is of the greatest service.

Simple Primary Anæmia.—Occasionally we see young children who are suffering from a type of anæmia which closely resembles chlorosis. There is no obvious cause for the bloodlessness, but the children are extremely pale and often have hæmic murmurs; there is little or no enlargement of the spleen. The blood also shows a small percentage of hæmoglobin, with a relatively slight diminution in the number of the red cells. The lymphocytes may be relatively increased, the polymorphs being diminished in number, and in young babies there may be quite a number of nucleated red cells. If the condition of the blood only were taken into account, these cases would be apt to be mistaken for leucocythæmia. A severe degree of this condition is rare, but sometimes the children look very ill and a considerable amount of œdema may even be present. Such cases may be met with at any period of childhood—in babies under a year old as well as in older children. The treatment is most

satisfactory, as the child rapidly and completely recovers when some preparation of iron is given.

Pernicious Anæmia.—This, in its typical forms, is an exceedingly rare disease in childhood. Of all the cases on record only five are probably genuine (Hutchison). It is very difficult to recognise during life, and even after death it is hard to identify.

Secondary Anæmia. — Young children are especially prone to develop secondary anæmia from all sorts of causes. Their red corpuscles seem to be more readily destroyed than those of adults, and are only slowly replaced. The marrow at this time of life is so fully occupied in the manufacture of hæmocytes under ordinary circumstances, that it is not capable of meeting special emergencies, as it does in adults, by a special hyperplasia. A diminution in the number of red cells and a fall in the percentage of hæmoglobin very readily take place, therefore, on slight occasion. At the same time there is apt to be some poikylocytosis, and a few nucleated red corpuscles may be found. It is these last-named abnormalities which form the characteristic hæmatological features of the secondary anæmias of very early life. Some leucocytosis is apt to be present, also, as the result of complicating conditions such as broncho-pneumonia.

Secondary anæmia may be due to too little iron and proteid in the diet. Lack of sunshine and fresh air are also important auxiliary causes. Attacks of acute infectious disease of any kind are very prone to produce anæmia, and the rheumatic poison seems to have a specially bad effect on the blood. Syphilis, tuberculosis, malaria, chronic diarrhœa, and septic conditions from bad teeth are all apt to lead to severe secondary anæmia.

Leukæmia.—Myelogenous leukæmia is scarcely ever met with in childhood, but cases of the lymphatic form of the disease are not very rare. In these the so-called "large

lymphocyte" is the predominating form of cell found in the blood, and in young children nucleated red cells and other abnormal corpuscles may also be present.

Mixed forms of leukæmia, in which both myelocytes and lymphocytes are present in large numbers, are specially characteristic of early childhood. It seems possible, as Fowler has pointed out, that "this may be the form which spleno-medullary leukæmia assumes in infancy."[1]

The exact duration of the disease in any case of leukæmia is generally unknown, owing to its onset being extremely insidious. It certainly tends, however, to run a much shorter course in children than in adults. Epistaxis and other forms of hæmorrhage are sometimes among the earliest symptoms. In other cases the tendency to bleeding only appears towards the end. Ulceration of the buccul mucous membrane is sometimes seen. Some glandular enlargement is usually present, and the spleen is generally, although not always, considerably increased in size.

While it is customary to give arsenic in these cases, it is very doubtful whether any *treatment* favourably influences their course.

Chloroma.—This is an obscure incurable disease, sometimes occurring in children, in which the blood condition resembles that in lymphatic leukæmia. It is so very rare that it is not necessary here to do more than draw attention to its very characteristic physiognomy. This is well shown in Figs. 63 and 64, which represent Dr. Melville Dunlop's case.[2]

Splenic Anæmia of Infancy (*Pseudo-leukæmia*).—The cases of this condition form the most characteristic group among the blood diseases of infancy. Whether they represent a separate disease or merely a form of secondary anæmia, need not be discussed here.

[1] *Internat. Clinics*, 1901, p. 135.
[2] *Brit. Med. Journ.*, 1902, i. p. 1072.

The *changes in the blood* are characteristic. The red corpuscles are diminished in number, but not very greatly (2,500,000 to 3,000,000). They vary considerably in size, and there is usually a slight degree of poikylocytosis. Nucleated red cells are present sometimes in large numbers—generally they are normo-blasts, but megalo-blasts are also found. A moderate degree of leucocytosis is usually present (20,000 to 60,000 per cub. m.m. at an age when 12,000 to 14,000 is about the normal number). There are many

FIG. 63.—Chloroma. Boy aged 5 years. Melville Dunlop's case.

FIG. 64.—Same.

transitional forms of white cells; indeed, the chief feature of the leucocytosis is its polymorphous character. There are always a few myelocytes present.

The *symptoms* usually set in gradually, and are somewhat indefinite at first. There is usually some degree of wasting, and often, if the child has been much in the open air, a peculiar brownish yellow pallor of complexion. The spleen is very big, often reaching to the pelvis. The liver is also commonly enlarged. The lymphatic glands are little if at all increased in size. Hæmic bruits are common. Attacks of

bronchial and intestinal catarrh are frequent, and unexplained rises of temperature are characteristic. In the later stages of those cases which do not do well there is a tendency to hæmorrhage. Rickets is almost always present, and the cranial bones are often markedly thickened and bossy. The disease is apt to occur in syphilitic and otherwise weakly children. It is curiously frequent in twins. I have seen more than a dozen instances of this. The disease is commonest between the tenth and eighteenth months of life, but it may occur any time between 6 months and 3½ years.

The *prognosis* in cases of the splenic anæmia of infants depends a good deal on the stage at which the patient comes under treatment, and the degree to which measures for the improvement of his general health can be satisfactorily carried out. Many cases recover completely. If petechial hæmorrhages have begun to appear, the prognosis is bad.

The main part of the *management* of these cases lies in the improvement of the general health by means of dietetic and hygienic measures, and especially in the thorough treatment of rickets or syphilis if either be present. Arsenic may sometimes do good, but iron is not often of much benefit.

Purpura

Purpura is common in childhood, and, as in adult life, occurs under a great variety of conditions. It may be symptomatic or idiopathic.

(*a*) *Symptomatic.*—In young children, purpuric symptoms are met with in cases of severe jaundice from any cause, in scurvy, in various forms of anæmia with enlargement of the spleen, in syphilis, in septic conditions of many kinds, in severe types of any of the acute infective diseases, including acute rheumatism and epidemic cerebro-spinal meningitis, in poisoning with various drugs, notably iodide of potassium, and

in cachectic conditions generally, whether due to tuberculosis, diarrhœa, atrophy, or other diseases. The treatment is that of the original disease.

(*b*) *Idiopathic.*—Idiopathic purpura occurs in three degrees of severity, which are sometimes spoken of as purpura simplex, purpura hæmorrhagica, and purpura fulminans. In all, the influence of drugs is disappointingly small. Ergot, hamamelis, turpentine, gelatine, calcium chloride, and adrenalin may be tried. It is certainly advisable in most cases to put the patient to bed and to begin the treatment by the administration of a mercurial purge. If the child has been underfed, a generous diet may be indicated. It is very doubtful, however, whether in ordinary cases a change in the food has any distinct effect on the purpura. The injection per rectum of anti-streptococcal serum (10 c.c.) has been recently recommended,[1] and has in several cases had a markedly beneficial effect.

The most interesting and important varieties of purpura in childhood are "Henoch's purpura" and the hæmorrhagic disease of new-born children. Hæmophilia very rarely begins to manifest itself in infancy.

Henoch's Purpura.—This name is given to a type of purpura which is mostly seen in older children, and which is especially important owing to the frequency with which it is mistaken for intussusception and other forms of intestinal obstruction, as well as from its pathological interest.

Its main *symptoms* are very acute abdominal pain, with tenderness over the colon, vomiting, and either bloody diarrhœa or constipation. There are also swelling and pain of the joints, subcutaneous hæmorrhages, and bleedings from mucous surfaces. All these clinical features, however, although often present may be either absent or so slight as to

[1] Soltau Fenwick and Porter Parkinson, *Med. Chir. Trans. London*, vol. lxxxix., 1906, p. 197.

be readily overlooked. Two other points are important in the matter of prognosis—namely, that the attack is apt to be repeated after a varying interval; and that acute nephritis not infrequently occurs, and may be fatal.

The *treatment* is mainly expectant, and consists chiefly in opium and the application of an ice bag to the abdomen.

Hæmorrhages in New-Born Children

The occurrence of hæmorrhages from various points is not uncommon in infants at, or soon after, birth. Cases where this occurs may be divided into three groups—

1. **Traumatic cases,** which are due to injuries received during labour. For instance, cephalhæmatoma, hæmatoma of the sterno-mastoid, apoplexia neonatorum, and hæmorrhages into various thoracic and abdominal organs.

In this group the cause ceases when the child is born, although the bleeding may go on for some time.

2. **Symptomatic cases,** in which purpura occurs as a symptom of some disease such as congenital obliteration of the bile-ducts, septicæmia, syphilis, or congenital heart disease. In these the inclination to bleed continues indefinitely along with the original malady.

3. **The Hæmorrhagic Disease of New-Born Children.**—This disease, which is probably due to micro-organisms, occurs in apparently healthy infants. The hæmorrhages may take place from the umbilicus, the gastro-intestinal tract, or the vagina, or into the subcutaneous tissue. They may be very slight or very severe. The most important thing about these hæmorrhages practically, however, is that whatever the cause may be it acts only for a short time, so that energetic treatment is of the greatest importance.

Spontaneous Umbilical Hæmorrhage generally takes the form of a steady diffuse oozing from the site where the cord

has separated or is about to separate. It usually starts about the fifth day of life, but may begin earlier or as late as the ninth day. It rarely lasts for more than three days, but is often fatal within twenty-four hours.

Gastro-intestinal Hæmorrhage (*Melæna Neonatorum*).—In these cases the blood is vomited or passed by the bowel, more frequently the latter. Sometimes there is only one large hæmorrhage, more often small quantities of blood are lost repeatedly. The motions passed may be red, but generally they are black in colour. The bleeding generally occurs for the first time on the second day of life, or at least before the fifth; rarely it begins as late as the second week.

It is very important to distinguish from this serious disease the "spurious melæna" which consists in the passage of blood which the child has swallowed. This may occur when there are cracks in the mother's nipple or when the child himself has epistaxis. In cases of true melæna, the effect of the loss of blood on the child's strength and appearance is soon obvious.

Vaginal Hæmorrhage is generally a trivial matter. It usually begins within the first six days of life, rarely after the twenty-first. It requires no special treatment.

Treatment.—In umbilical hæmorrhage, intelligent and patient digital pressure on the bleeding point is very useful, combined with the local, as well as internal, use of adrenalin (1 to 1000 solution). The actual cautery, or nitrate of silver, and the application of plaster of Paris have been successful in some cases. If other means fail, the base of the bleeding point should be transfixed by a hare-lip pin and a ligature applied round it.

The treatment of melæna neonatorum consists in keeping the child as quiet as possible, wrapped in cotton-wool and surrounded by hot water bottles. If very weak, he should not be allowed to suck, but should be fed by a spoon or glass

syringe with small quantities of breast-milk or peptonised milk cooled in ice. Injections into the bowel are inadmissible, because they do harm by stimulating the intestinal movements. The only medicine which seems to have a distinct effect in controlling the bleeding is adrenalin chloride. Of this mss to i of a 1-1000 solution may be given every hour.

Hypodermic injections of a 2 per cent. solution of gelatine in normal salt solution has been used with success by Holtschmidt[1] in five consecutive cases. The solution is boiled for five or six hours in a flask stoppered with cotton-wool, and is warmed to bloodheat before use. Half an ounce of this is given divided into two injections, and one dose is usually enough, although two, or even three, may be required. The greatest care must be taken in the selection of the gelatine, as well as in its sterilisation, because commercial gelatine may contain tetanus bacilli. In one or two cases where the exhaustion from loss of blood was great, I have seen marked benefit from the subcutaneous injection of two or three ounces of sterilised salt solution.

The Thymus

The authorities who have written on the thymus differ greatly as to what is to be considered its normal weight. It is now certain that the older writers gave far too large a figure. This was due to their taking as their normal standard the thymus glands of infants who had died suddenly in the midst of apparently perfect health. We now know that it is just in such children that we may expect to meet with an enlargement of the organ. Thus Friedleben,[2] by far the greatest of the older authorities, gives

[1] *München. med. Wochenschr.*, 1902, Jan. 7.

[2] *Die Physiologie der Thymusdrüse in Gesundheit und Krankheit*, Frankfurt-a'M., 1858.

20 grammes as the normal weight; while more recent writers, such as Bovaird and Nicoll,[1] Thursfield,[2] and Dudgeon,[3] place it at 6 or 7 grammes only.

The opinion, formerly prevalent, that the normal organ grows in size until the end of the second year, has also been controverted; and it is now believed that it remains about the same size as at birth during that period.[4] The size of the thymus at any age varies greatly in different individuals, and also in the same individual according to the state of his nourishment at the time. There is no other organ in the body which changes so much in size.

For such a large and such a characteristically infantile organ, the thymus has, strangely, little known clinical significance. It is always found to be much atrophied in cases of infantile marasmus. Indeed, this is the most characteristic anatomical change found in the bodies of atrophied babies—apart from the wasting of their fat and muscles. It is said that the state of nutrition of an infant may be estimated by a microscopical examination of its thymus.[5]

When the thymus is hypertrophied, there is sometimes a recognisable increase in the usual area of dulness in the region of the manubrium sterni. Generally, however, there is no other indication of its enlargement, so that it is apt to escape notice altogether.

Status Lymphaticus (*Lymphatism*)

The status lymphaticus is a condition of bodily debility which is chiefly characterised by hyperplasia of the thymus and of the lymphoid tissue generally throughout the body. It is accompanied by a great lowering of the patient's power

[1] *Arch. of Ped.*, Sept. 1906, p. 641.
[2] *St. Bart. Hosp. Rep.* vol. xxxviii., 1903, p. 129.
[3] *Trans. Path. Soc. Lond.* vol. lv. pt. ii., 1904, p. 151.
[4] Bovaird and Nicoll, *loc. cit.*
[5] Stokes, Ruhräh, and Rohrer, *Amer. Journ. Med. Sci.*, Nov. 1902, p. 847.

of resistance, and is believed to account for a large number of otherwise unexplained cases of sudden death.[1]

Various suggestions have been made as to why a lymphatic habit of body should give rise to such a dangerous state of weakness of the heart and nervous system, and the question is still undecided. Escherich[2] believes that there is a sort of hyperthymisation of the blood which keeps up a constant state of irritable weakness in the nervous system, so that trivial causes have unexpectedly severe effects. He regards lymphatism, therefore, as due to a disordered action of the thymus somewhat in the same way as myxœdema and exophthalmic goitre depend on disordered thyroid action.

Symptoms.—Children with lymphatism are generally pale, flabby, and rather fat. If, as often happens, they are infants, they are usually rickety and often have laryngismus. The tonsils and the adenoid tissue in the naso-pharynx are hypertrophied and the spleen is palpable. Some enlargement of the lymphatic glands may often be found, and occasionally the hyperplasia of the thymus may be suspected, if not exactly proved, from the amount of dulness on percussion found over and near the manubrium sterni. Generally, however, the indications of the presence of lymphatism are so vague and indefinite that the child is not thought to be in any danger until serious symptoms set in. Sometimes these symptoms consist in a succession of ill-defined convulsive seizures, accompanied by faintness, cyanosis, and dyspnœa, which recur at intervals for weeks or months.

In most cases, however, fatal syncope occurs as the result of some trivial exertion or shock without there having been any previous warning of danger. The child who has been regarded as in good health, or, perhaps, as only flabby and

[1] Arnold Paltauf, *Wien. klin. Wochenschr.*, 1889, ii. p. 877 ; and 1890, iii. p. 172.

[2] *Berlin. klin. Wochenschr.*, 1896, xxxiii. p. 645.

unenergetic, suddenly becomes faint, gasping, and cyanosed, his eyes turn up, and he loses consciousness. Convulsive movements may or may not occur. The heart stops before the respiration.

There is often no apparent exciting cause for the seizure, but generally some shock of a trifling kind has preceded it. A sudden plunge into water, a wet pack, a hypodermic injection, even the application of a tongue-depressor, have been known to suffice. Some of the sudden deaths during the administration of chloroform and other anæsthetics, and during convalescence from such infectious diseases as diphtheria and typhoid, are believed to be due to the presence of the status lymphaticus.

The **diagnosis** must usually remain more or less a matter of conjecture. When the presence of lymphatism is suspected, the **prognosis** must always be extremely guarded, because any child who possesses a greatly enlarged thymus has in all probability a very slender hold on life.

Treatment.—If the presence of the status lymphaticus is diagnosed or suspected, we know of no form of treatment which will remove it. We must, however, under these circumstances, be exceedingly careful about administering an anæsthetic or even a wet pack that is not quite necessary, or doing the smallest operation that is not urgently called for. When syncope actually sets in, no known treatment is of any avail.

CHAPTER XIII

ON THE HEART AND CIRCULATION

The Pulse

In Health.—At birth the *pulse-rate* ranges between 120 and 140 per minute. The following may be regarded as about the average in healthy children during sleep and perfect quiet:—

6 to 12 months . . .	115 to 105
2 to 6 years . . .	105 to 90
11 to 14 years . . .	85 to 75

Perhaps the most striking feature of the normal child's pulse is its *variability*. Its rate varies in different children according to their age, size, sex, and temperament; and in the same individual it is altered, even more markedly than in the adult, by nervous, postural, and other influences. It is, of course, rendered more rapid by sitting up, and slowed by rest in bed. It may be quickened as much as twenty or thirty beats in the minute by mental emotion or by bodily exercise. It is, therefore, of great importance to count the pulse when the child is quiet, or, best of all, when he is sleeping.

The occasional occurrence of *irregularity* in rhythm and force of the pulse is to be regarded as a normal feature of healthy childhood.[1] It may occur whenever the pulse slows from any cause. It is most marked in older children (after eight years), and is especially apt to accompany the slowing

[1] James Mackenzie, *The Study of the Pulse*, Edin. 1902, p. 54.

which follows any sort of fever. Sleep and the prone position favour its appearance. Quickening of the pulse puts an end to this irregularity. The type of irregularity met with in health is the same as that which almost invariably occurs in illness (*v. infra*).

Sphygmometry.—With practice, very good tracings may be taken of the radial pulse even in young infants.[1] A Dudgeon's sphygmograph is the best instrument to use, and it should be held in position by a soft piece of elastic instead of by the ordinary bands supplied with the instrument.

In new-born children the pulse is very small, even for the size of the child, and the tracing shows the characters usually

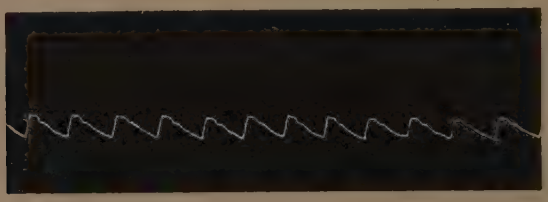


FIG. 65.—Pulse of a normal infant 6 days old (indicates a relatively high arterial pressure).

attributed to a relatively high arterial pressure. Its main characteristics are that the up-stroke is somewhat slanting and that the dicrotic notch stands high on the down-stroke (Fig. 65). It recalls the tracing of an aortic stenosis or that of some aneurism cases. After the first few months of life the volume increases and a double summit develops (Fig. 66). The high-pressure type persists throughout the whole of the

[1] See Dr. H. O. Nicholson's articles on "The Pulse" in the *Encyclopædia Medica*, "On the Pulse in Infancy," *Scottish Med. and Surg. Journ.*, May 1901, p. 419, "On the Pulse in Pneumonia in Children," in the *International Clinics*, vol. iv. 11th series, 1902, p. 122. Dr. Nicholson has kindly allowed me to use the accompanying sphygmographs, which were all taken by him from patients of mine, and most of which have already appeared in his *Encyclopædia Medica* article.

first year. At this age dicrotism is rarely produced even by a very high temperature (Nicholson) (Fig. 67).

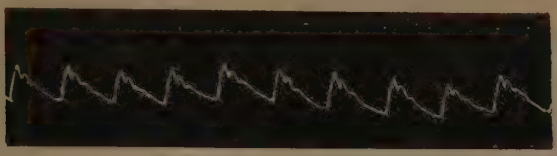


FIG. 66.—Pulse of child aged 4 months. (Shows the division of the systolic wave into two summits.)

In Disease.—In disease also the tendency to variability of the pulse is a marked characteristic of childhood.

The pulse is greatly quickened by fever, and when

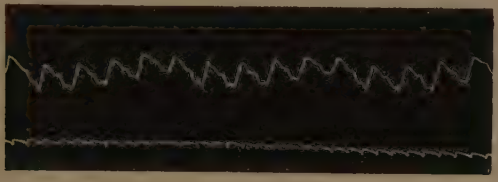


FIG. 67.—Pulse of a child aged 11 months; temperature, 105° F. (Dicrotism has not been produced.)

the fever subsides, it tends to become abnormally slow and at the same time irregular. A very rapid pulse is often a help in the diagnosis of scarlet fever. Generally speaking,

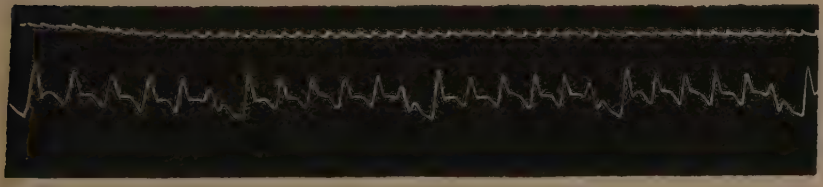


FIG. 68.—"Adult type" of intermittent pulse in child aged 2 years, with mild apical pneumonia. The child did well.

however, mere rapidity of the pulse has a much less serious significance in early than in later life. In infants the pulse is not slowed by jaundice as it is in adults.

A slow and irregular pulse is especially characteristic of intra-cranial disease. What James Mackenzie calls "the adult type" of intermittency (in which the duration of the ventricular systole is variable and which is the common type in later life) is rarely met with in childhood, but it does occasionally occur (Fig. 68).

The "youthful type" of irregularity is that which is almost always found in childhood, both in health and disease. In it the irregularity consists in varying lengths of the diastolic periods of the cardiac cycle—the systolic periods remaining of equal duration (Fig. 69).

Increased rapidity of the pulse makes it more regular,

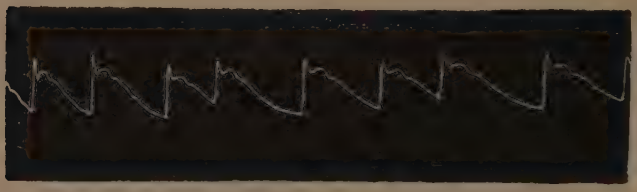


FIG. 69.—Pulse of child aged 5 years, showing "youthful type" of irregularity.

because, the diastolic periods being shortened, their inequality becomes less noticeable.

Paroxysmal Tachycardia.—This condition is very rare indeed in children, but does occasionally occur in a very marked form. It may begin as early as five or six years old, and the pulse-rate may reach 240 in the attacks. The treatment and prognosis are as unsatisfactory in children as in adults.[1]

Pulse in Meningitis.—A slow and irregular pulse is frequently found in the early stages of tuberculous meningitis. Slowness and irregularity being, however, as we have seen, common in healthy childhood, this alone cannot be regarded as diagnostic. When we also find the artery contracted so that

[1] Herringham, *Trans. Clin. Soc. Lond.*, Jan. 8, 1897, vol. xxx.; Merklen, *Soc. méd. des hôp.*, 10 Mai, 1901.

it rolls under the finger, this is an important additional indication. And if the pulse remains slow and irregular when the temperature rises, this is most significant of intracranial disease (Fig. 70). Under two years of age marked slowing and irregularity of the pulse is less frequently found in tuberculous meningitis than it is in older children. In

Fig. 70.—Pulse in tuberculous meningitis (child aged 3½ years). Radial artery small and contracted. Pulse irregular.

these very young children the great irregularity of the respiration is even more characteristic than that of the pulse.

In posterior basic meningitis the pulse is not slow or irregular, and it shows no marked contraction of the artery. During the later stages of tuberculous meningitis in young children a very rapid pulse is often met with, the rate of which is found

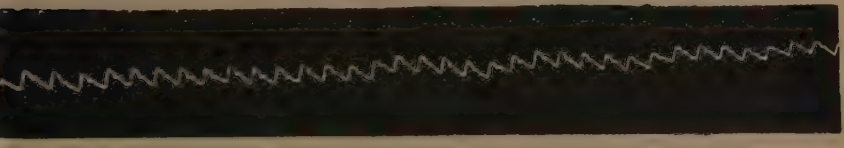


Fig. 71.—Very rapid pulse in the last stage of tuberculous meningitis (child aged 2½ years).

to vary greatly in different quarter-minutes, although no marked irregularity is detected by the finger alone (Fig. 71).

Pulse in Mitral Disease.—There is no special peculiarity in the pulse of mitral disease in children; as a rule we find the "adult type" of irregularity appearing.

Pulse in Pneumonia.—The character of the pulse in pneumonia in children often forms a better guide both to

prognosis and treatment than do the physical signs in the lungs. Great lowering of the blood pressure is apt to occur, especially in broncho-pneumonia. When this happens in older children, and even in babies in bad cases, the pulse becomes dicrotic and finally monocrotic (Figs. 72 and 73).

FIG. 72.—Pulse in broncho-pneumonia; of fatal significance if it persists for several days (child 1¾ year old).

A rapid pulse with falling blood pressure is a matter of grave omen. Should the pressure fall so low that the pulse becomes monocrotic early in the case, or should this condition remain for several days, it is a very fatal sign.

Pulse in Nephritis.—Very high tension of the pulse in nephritis is rare in little children. It is more common to

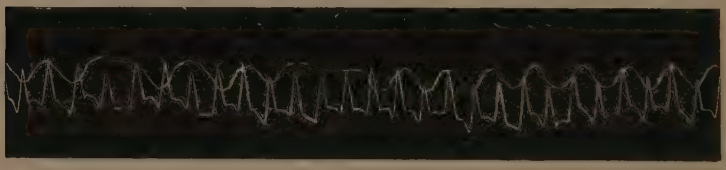


FIG. 73.—Monocrotic pulse from fatal broncho-pneumonia (child aged 6½ years). Pulse 160. Respiration 76. Temperature 104° F.

find in them a fairly normal tension. A low tension pulse in nephritis is a bad sign in children as it is in adults.

THE HEART

Whatever a child's complaints and symptoms may be, we can never safely omit a careful physical examination of his heart;[1] for many possible faults in that organ cause no

[1] See Dr. D. B. Lees' very interesting address on "The Heart of the Child" in his work on *The Treatment of Some Acute Visceral Inflammations, and Other Papers*, London, 1904, p. 252.

subjective symptoms whatever, and need a local examination to reveal them. While we are eliciting the physical signs connected with the heart, we must not forget (as students are so apt to do) that they are only of interest so far as they teach us something about the state of the heart's structure and the way it is doing its work. We have to gather from them its position, its conformation, and the condition as to size and strength of its different parts, and also whether there is any pericardial effusion.

Inspection.—In cases of hypertrophy of the heart in children, there is often considerable bulging of the soft chest wall. Abnormal pulsations are also easily visible in childhood, whether in the epigastrium or elsewhere, owing to the nearness of the heart to the surface. *Venous pulsation* above the clavicle is common in children when they are lying down. It occurs under very various conditions and is often very difficult to explain. In many cases certainly it has no serious significance.

Palpation.—A great deal can be made out by palpating a child's præcordial region if the hand used is warm and gentle. There is firstly the *apex beat* to be investigated, its *position, force,* and *character.* In children under four years the apex beat is normally situated outside the nipple-line in most cases, and in the fourth instead of the fifth intercostal space. This is because the heart occupies a more horizontal position in infancy. As the child grows older, however, the apex beat gradually comes to assume the adult position. It may be displaced to one or other side by pleural effusions, and upwards by pericardial effusion and by abdominal distension. In palpating the apex beat it is important to observe not only whether it is displaced, but also whether it is forcible as in hypertrophy of the heart, or feeble as in dilatation; and if it is well defined as in hypertrophy of the left ventricle, or diffuse as in enlargement of the right.

The *epigastrium* is next to be felt, for pulsation of the right ventricle. If this is present, it signifies either displacement of the heart to the right, disease of the left ventricle, congenital heart disease, or lung disease. The *liver edge* may be conveniently palpated at the same time, as hepatic enlargement from venous engorgement is a very important symptom of backward pressure from the right side of the heart.

Thrills are very easily felt in children, and their character and exact distribution are important in diagnosis.

Percussion.—It is never necessary to percuss otherwise than very lightly, or to use anything but the fingers. The main object of percussion is to ascertain, from the deep dulness of the heart, its size and especially that of the left ventricle and right auricle; also whether the organ is displaced.

To judge the size of the *left ventricle* we percuss the heart's left border, which ought to lie half a finger-breadth or so to the left of the apex beat. When, as sometimes happens, the left border is rapidly displaced outwards so as to reach two or even three finger-breadths beyond the nipple-line, this indicates *dilatation of the left ventricle*. Confirmation of this may be obtained by finding a feeble pulse, a feeble and diffuse apex beat, a feeble first sound at the apex, and accentuation of the pulmonary, and often also of the aortic, second sounds. Such dilatation is a cause for great anxiety, as it indicates an urgent danger of fatal syncope. It is to be watched for in such debilitating diseases as influenza and enteric fever, and especially in acute rheumatism and in diphtheria both during and for some weeks after the throat affection. It is to be treated by keeping the patient constantly lying flat for weeks. Digitalis is very useful in some cases, and in diphtheritic cases belladonna and atropine are strongly recommended (Lees).

The *right auricle* forms the right limit of the cardiac dulness, and this normally reaches one finger-breadth to the

right of the sternum in the fourth space. When it becomes dilated the dulness may extend two or even three finger-breadths from the sternum in this space, and from a half to one and a half in the third.

Great distension of the right auricle is an urgent danger-signal, as it threatens death from asphyxia. It calls for immediate relief by means of leeches or venesection. Displacement outwards of one or other border of the heart is of course also met with, apart from enlargement of the organ, when it is pushed to one side—*e.g.* by pleural effusion.

Auscultation.—The normal heart sounds in little children are peculiar in certain ways. The first sound is louder than the second in all the areas, so that even over the base of the heart their rhythm is trochaic and not iambic as in adults. This is attributed to the fact that the arteries have a relatively larger calibre in childhood and the arterial tension is consequently lower.

The pulmonary second sound over the base is normally louder than the aortic. We have to judge, therefore, of the strength of the pulmonary second sound by comparing it with the first sound in the same area; and if the second is constantly the louder of the two sounds there, it is to be regarded as accentuated (Hochsinger [1]). To settle this question, however, the heart must be auscultated when the child is not frightened, because emotional disturbance causes a temporary accentuation of the pulmonary second sound. The heart sounds are heard more distinctly all over the thorax in young children than in adults. This is owing to the favourable conditions for conduction offered even in health by the child's thorax.

Murmurs may be *functional* in origin, or they may arise from acquired valvular defects or from congenital malformation of the heart. When the heart is going very rapidly at

[1] *Die Auscultation des kindlichen Herzens*, Wien, 1890.

the time of examination, it may be almost impossible to make sure of the presence of murmurs even when they are quite loud at other times.

Functional murmurs are certainly much less common in children than in adults. They do occur, however, occasionally even in young children. A systolic tricuspid murmur is heard not very rarely in children who are apparently quite well. "It is a low, soft, short murmur, best heard about half-way between the left edge of the sternum and the nipple-line, and usually becoming inaudible at a short distance to the left of this line. It is sometimes accompanied by slight irregularity of the heart's action" (Lees [1]). I have several times known such murmurs, and also anæmic murmurs over the base of the heart, to give rise to an erroneous diagnosis of congenital malformation or valvular disease.

Congenital Heart Disease

Congenital malformation of the heart may be due to the persistence of fœtal conditions which ought to have ceased soon after birth (*e.g.* patent ductus arteriosus or foramen ovale). It may also be caused by some earlier interference with development, leading to patency of the interventricular opening, to absence of one of the large blood vessels or of one of the principal orifices, or to the transposition of vessels, etc.; or it may be the result of fœtal endocarditis.

Symptoms.—The main symptoms by which we recognise the presence of congenital heart disease are of four kinds: (1) Cyanosis with concentration of the blood and clubbing of the fingers and toes; (2) certain murmurs, and variations in the loudness of some of the heart sounds; (3) alterations in the size and shape of the heart; (4) various indications of circulatory disturbance, such as great general debility, some dyspnœa, and, rarely, heart pain; also, commonly, recurrent

[1] *Loc. cit.* p. 265.

epistaxis and epileptiform seizures of various types. Marked malformation may, however, be present and produce either no symptoms at all, or only cyanosis, only a murmur, or only debility.

Cyanosis is frequently absent in congenital heart cases. When present, however, it is an important symptom, because it is never due in young children to acquired heart disease, and only rarely so in older children. The same is true of *clubbing of the fingers and toes.*

The *murmurs* due to congenital heart disease are almost always systolic, and are generally loud unless the heart is acting feebly. Their situation varies very much. It is to be remembered that murmurs due to congenital cardiac defects change considerably in character and distribution if the patient becomes anæmic. In rare cases the character of the murmurs varies somewhat at different times.

The heart may be greatly *enlarged* or it may be altered in shape from hypertrophy of certain parts. In many cases, however, no change in its conformation can be discovered.

Diagnosis.—The diagnosis of the exact lesion in cases of congenital heart disease will always be an interesting question. In the large majority of cases, however, it is one which must remain unanswered owing to its extreme difficulty; and even when the lesion can be ascertained, its diagnosis is rarely of any importance in settling the prognosis and treatment.

What is of real importance is to settle, *firstly*, whether the lesion is a congenital or an acquired one (and this is usually tolerably easy in young children), and, *secondly*, to ascertain from the general symptoms the degree to which it is interfering with the heart in the efficient performance of its functions.

The importance of cyanosis in determining the congenital nature of a heart case has been already referred to.

Hochsinger's [1] views with regard to the diagnosis by auscultation are very useful. They are founded on observation of children under five years old. After that age the diagnosis becomes increasingly difficult, owing partly to the frequency of secondary endocarditis of the congenitally abnormal structures. His conclusions (slightly abridged) are as follows:—

1. *Loud*, harsh, musical murmurs, with a *normal or but slightly increased area of dulness*, are met with, in little children, only in congenital cases. When acquired inflammatory heart affections occur in them with very loud murmurs, they invariably cause great increase in the cardiac dulness.

2. The occurrence of murmurs along with *greatly increased cardiac dulness* and *feeble* apex beat in young children is in favour of congenital disease. The increased dulness depends mainly on the right heart, while the left is but slightly altered. On the other hand, acquired heart disease in children is accompanied by increased force of the apex beat, because its effect falls first on the left side, while the dilatation of the right heart sets in later and does not affect the increased strength of the apex beat.

3. The complete *absence of murmurs at the apex*, while they are distinctly *present in the region of the auricles and over the pulmonary orifice*, is always an important element in the differential diagnosis, and is more in favour of septal defects or pulmonary stenosis than of endocarditis.

4. Abnormal weakness of the pulmonary second sound, along with a distinct systolic murmur, can only be explained in early childhood by assuming the presence of congenital pulmonary stenosis, and consequently is worth remembering as a point in the differential diagnosis.

[1] "Ueber Diagnostik angeborener Herzfehler bei Kindern," *Wiener Klinik*, Feb. 1891.

5. Absence of a palpable thrill, in spite of very loud murmurs audible all over the præcordial region, occurs almost exclusively in cases of congenital septal defects, and this condition is therefore against a diagnosis of acquired heart disease.

6. Loud, especially humming, systolic murmurs with the point of maximum intensity situated over the upper third of the sternum, and without any symptom of marked hypertrophy of the left ventricle, are very important for the diagnosis of persistence of the ductus arteriosus, and cannot be explained by the assumption of endocarditis of the aortic valves.

Dr. G. A. Gibson has drawn attention[1] to a peculiar systolic murmur as being pathognomonic of simple patency of the ductus arteriosus. This murmur begins distinctly after the commencement of the first sound, lasts through the short pause and the second sound, and dies away in the long pause. It is accompanied by a correspondingly prolonged systolic thrill over the base of the heart to the left of the sternum. When such a murmur is present there is probably always a persistent arterial duct. I have, however, seen more than one case of open ductus in which the diagnosis was confirmed by post-mortem examination, and in which the systolic murmur was not continued up to the second sound.

Prognosis.—The prognosis depends largely on the state of the child's development and on his general vigour, also on the presence or absence of hypertrophy of the heart and cyanosis, and little on the character of the murmur. Thus, on the one hand, if a child has lived several years with a congenital heart lesion and his nutrition and vigour have been tolerably well sustained, if cyanosis and finger-clubbing

[1] "Persistence of the Arterial Duct and its Diagnosis," *Edin. Med. Journ.*, July 1900.

are absent, and the heart little, if at all, hypertrophied, the prognosis as to his reaching manhood may be fairly good. On the other hand, if the cyanosis is marked, the child weakly, and the heart enlarging in spite of care, the prognosis is very bad.

Remember, however, in estimating the effect of a congenital heart lesion on the general health, not to attribute to its influence debility arising from other causes. I have more than once seen children with congenital heart disease who were supposed to be dying from it, but whose alarming symptoms arose mainly, if not altogether, from severe rickets or some other diet disorder, and who rapidly recovered strength under ordinary treatment.

Treatment.—The treatment consists mainly in keeping the child warm and attending to his nourishment. For the cyanosis and general symptoms digitalis is of no use, but in some cases it is occasionally of value when there are signs of failure of compensation.

Acquired Heart Disease

Endocarditis may occur at any age. It is, however, comparatively rare in children under three. It may affect any of the valves, but in the great majority of cases it is the mitral which suffers. It is characteristic of childhood that the myocardium and pericardium are apt at that age to be often and severely affected.

Symptoms.—The physical signs of endocarditis in children do not differ essentially from those in later life, but hypertrophy and dilatation occur more readily and more rapidly than in adults. The general symptoms of valvular heart disease noticed in young children are usually very indefinite. There may be a slight rise of temperature, pallor, a short dry cough, breathlessness on exertion, palpitation, and emaciation. Even in severe cases of valvular disease it is comparatively rare in childhood to meet with the great

œdema of the limbs, enlargement of the liver and spleen, dyspnœa, and cyanosis which are so commonly seen in the adult in advanced cardiac disease.

Causes.—Heart disease in children may arise from many causes, some of which are obscure in origin. The great majority of cases, however, are due to rheumatism, and the main thing we want to know about the cause of any case is whether it is or is not rheumatic. This question is an important one, because, if the lesion is rheumatic, it throws light on the child's tendency to disease, and indicates much with regard to his present and future treatment. The absolute diagnosis of rheumatism must depend on the presence of one or more other manifestations of that disease in the patient, or on the past history of their having been present. If characteristic arthritis of one or more joints exists, that is usually held to be sufficient to settle the question; and the presence of erythema circinatum or of choreic movements has practically the same significance. The most satisfactory proof, however, of the presence of rheumatism is the finding of rheumatic nodules (Chap. XXII.).

Treatment.—The treatment of any recent form of acquired heart disease in childhood differs in no important respect from that in adults. The first and main point, the importance of which it would be difficult to exaggerate, is that the child be kept lying and all exertion avoided both during and for months after the illness. The next point is that if the case is, or may be, rheumatic, it should be treated actively by anti-rheumatic measures, including salicylate in large doses (Chap. XXII.). In severe cases of chronic valvular disease in children, with commencing symptoms of backward pressure, a course of grey powder may greatly assist the action of digitalis or strophanthus, just as blue pills often do in adult patients.[1]

[1] William Murray, *Rough Notes on Remedies*, London, 3rd ed., 1899, p. 49.

Pericarditis.—In children under three years, pericarditis is generally met with as a complication of empyema or pneumonia. Such cases of pneumococcal pericarditis are apt to be overlooked, because there are often no ascertainable subjective symptoms and also no friction.

In older children the condition occurs most frequently as a manifestation of rheumatism. When this is so it generally—although not always—runs rather a subacute course, with little or no fluid effusion. If the case is at all severe, the myocardium is usually also more or less extensively implicated, and dilatation of the heart occurs. Pericarditis is generally met with in children who have already suffered from other rheumatic manifestations.

Occasionally severe pericarditis sets in suddenly in children, apart from rheumatism, as a primary disease. In these cases the friction is very loud, but there are scarcely any other distinctive symptoms—merely a slight præcordial uneasiness with a rise of temperature. Recovery usually takes place, if the case is recognised early and the patient kept in bed.

Pericarditis is also a not very uncommon occurrence in the course of tuberculosis, scarlet fever, and other infective conditions.

Treatment.—In slight cases of rheumatic pericarditis, nothing beyond the general anti-rheumatic treatment is called for. When the case is at all severe, however, local measures become very important.[1] The main danger in such cases arises from the tendency of the right auricle to become over-distended. It must therefore be closely watched by percussion in the right intercostal space, and if it is found to be dilating, leeches (four to six) should be at once applied over the heart. This may be followed by the subcutaneous injection

[1] Lees, *Treatment of Some Acute Visceral Inflammations*, London, 1904, p. 32.

of liquor strychninæ (mss to i) every three hours; in less acute cases the drug may be given by the mouth. An ice bag should then be applied over the præcordial area, the patient's lower limbs having first been thoroughly warmed by hot water bottles (p. 561). The child should lie on his back, and the ice bag should be placed over the heart with nothing between it and the skin of the præcordia. If there is local tenderness, the ice bag should, to begin with, be suspended over the patient so that it just touches his chest. It should be refilled every hour and a half, and the hot bottles every three hours. Children practically always like this mode of treatment, and wish it reapplied when it has been discontinued.

Along with the local treatment, salicylate and bicarbonate of soda should, in most cases, be given internally.

Aneurism

Aneurism is an extremely rare condition in childhood. Le Boutillier[1] has found records of more than thirty cases under 12 years. The symptoms are usually very obscure, and the patients cachectic.

Raynaud's Disease

This name is given to a series of cases in which there occur, from time to time, paroxysmal attacks of extreme numbness and chilliness of the extremities, with a more or less symmetrical distribution. According to Raynaud, the local condition depends on an undue irritability of the vasomotor centre or centres, owing to which, ordinary causes of stimulation, such as slight cold, produce exaggerated effects, and result in prolonged paroxysmal contraction of the peripheral arterioles. He describes the effects of the arterial spasm as occurring in three degrees of severity—local syncope, local asphyxia, and local symmetrical gangrene.

[1] *Amer. Journ. of Med. Sciences*, May 1903.

Local Syncope.—In this, one or more digits on each hand or foot becomes white and "dead." The condition varies greatly in severity, being sometimes merely a slight exaggeration of the chilliness of the extremities which is natural to many children. There may be little or no pain, merely a degree of discomfort with some analgesia and blunting of the tactile sense. After a few minutes—or a few hours, as the case may be—the attack passes off, with a sensation of burning heat, and the affected part soon resumes its usual colour. The patient's general health seems unaffected. The attacks generally occur in cold weather, and there has often been some slight exposure to cold air or cold water. They also often set in after a full meal.

Local Asphyxia.—In this the affected extremities, or digits, assume a deep dusky purple colour and become painful and tender. Generally the hands and feet are affected, less commonly the helix of the ears, and rarely the nose. Local asphyxia may succeed to local syncope, or it may occur without any previous pallor of the parts being noticed.

Local Symmetrical Gangrene.—This is the terminal stage of the two other degrees; fortunately, it is not often reached. Sometimes the extremities of the digits become gradually black and mummified. In other cases the necrotic process begins with the formation of bullæ on the surface of the cyanosed parts, as happened in the case shown in Fig. 74.

In a certain number of cases of Raynaud's disease we meet with hæmoglobinuria at the time of the attacks. Sometimes, also, there is marked mental torpor; and epileptic fits occasionally occur. Peripheral neuritis has been found in the affected limbs.

Diagnosis.—Severe cases of chilblain are apt to be mistaken for this disease. Chilblains differ from Raynaud's disease, however, in lacking the paroxysmal character, in not

being usually situated so entirely at the extreme ends of the digits, and in generally showing some signs of inflammatory exudation.

Treatment.—The most important part of the treatment is the prophylaxis which consists in attending to the digestion and nutrition, and in guarding against any unnecessary exposure.

When the attacks occur, the most successful means of

FIG. 74.—Gangrene of Toes following Raynaud's Disease. Boy aged 7 years.

relieving the symptoms, especially in acute cases, consist in the use of the galvanic current. The best mode of applying it is described as follows by Sir Thomas Barlow: "Immerse the extremity of the limb which is the subject of local asphyxia in a large basin containing salt and tepid water; one pole of a constant current battery is placed in contact with the upper part of the limb, above the level of the water, and the other pole in the basin, thus converting the salt and water into an electrode. As many elements as the patient

can comfortably bear should be employed; and the current should be made and broken at frequent intervals, so as to get repeated moderate contractions of the limb. The patient should also be instructed to make voluntary movements of the digits while the galvanism is applied."[1] When the two limbs are equally affected, in a typical paroxysmal case, and the electric treatment is applied only to one of them, the limb thus treated is found to recover more rapidly than the other which is merely kept warm. Massage and Swedish movements should also be used. If the pain be severe, or if gangrene threaten, opium is indicated.

[1] Barlow, art. on "Raynaud's Disease," *Allbutt's System of Medicine*, vol. vi., 1899, p. 605.

CHAPTER XIV

ON THE EXAMINATION OF THE LUNGS AND RESPIRATORY PASSAGES

Inspection

Inspection determines (1) the form of the chest and (2) its movements.

Form of the Chest.—The normal infant's chest differs considerably in shape from the adult's. It is more cylindrical in form, and its section is consequently more nearly circular in outline. The shape is readily altered by any disease that tends to soften the already soft chest wall or to interfere with the free expansion of one or both lungs. The commonest alteration which we meet with is the deformity due to rickets, but we also find various degrees of pigeon-breast, and occasionally, as in adults, unilateral retraction or distention, due to pulmonary or pleural disease or to spinal curvature.

The **rickety thorax** is chiefly characterised by beading of the ribs and by its peculiar shape (Figs. 129–133). The *beading* or so-called rosary is situated at the junction of the cartilaginous and osseous portions of the ribs, and is due to a swelling of the cartilage. It is generally easily visible, but in slighter cases, and in fat children, it is only to be made out on palpation. In all cases the swellings project more on the pleural side of the chest wall than outside. The first and second ribs are the least affected, while the largest beads are found on the fifth and sixth—that is, on those with the widest range of movement.

Comparatively rarely, and generally only in severe cases, we find *posterior beads* on one or other side of the back of the chest (Fig. 135, p. 476). These swellings are asymmetrical in position, and their pathology is quite different from that of the ordinary rickety rosary. They are composed of callus which has formed round green-stick fractures of the ribs, caused usually by lateral compression of the chest in lifting the child. Similar lesions of the clavicles, caused by lifting the child by his upper arms, are occasionally met with.

As the thoracic wall is abnormally soft and yielding outside the line of the beading, it becomes indrawn in this position, causing parallel grooves in front of and behind the rosary. There is usually also a transverse groove running horizontally across at the level of the upper end of the xiphisternum.

When the chest is severely affected (Figs. 129–133), it has a peculiar shape, owing to the deepness of the hollowing out along the line of the costo-chondroid joinings. This results in the sternum and costal cartilages being pushed forwards as a bulging rounded projection, while a cyrtometer tracing of the thorax somewhat resembles the outline of a violin (Fig. 75).

In **pigeon-breast** the abnormal projection is more pointed, so that its horizontal outline is almost triangular (Fig. 76). This deformity may be said to present, in a permanent form, the shape which the normal child's chest assumes (temporarily) whenever there is forcible inspiration with the upper air passages narrowed (*e.g.* in croup and whooping-cough), or when there is something else preventing the inflation of the lungs. It arises from long-continued and frequent repetition of this temporary change of form.

In infancy it is occasionally seen in congenital atelectasis, in bronchitis with collapse, in congenital laryngeal stridor, and in various other forms of disease. It may sometimes

be watched developing in a perfectly well-formed chest during a severe attack of whooping-cough. When present in older children, there is generally a history of recurrent bronchitis, and not infrequently evidence of the presence of adenoid growths in the naso-pharynx.

The chest deformity most frequently associated with adenoids, however, is a mild degree of the so-called "funnel chest" (*Trichterbrust*). In this there is more or less hollowing out of the sternal region, without the beaked projection above, which is characteristic of typical pigeon-breast.

In some weakly children, especially in those suffering

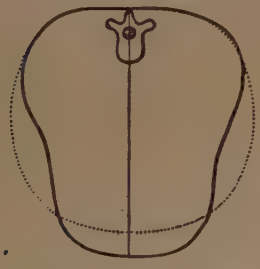


FIG. 75.—Rickety Chest. Dotted line indicates shape of chest in an infant of about the same age (Gee).

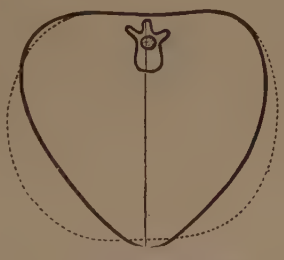


FIG. 76.—Pigeon-Breast. Tracing taken from a child of 7 years. Dotted line indicates natural shape at same age (Gee).

from certain organic diseases of the central nervous system, we sometimes meet with a form of chest deformity which contrasts markedly with pigeon-breast. In this the thorax is broadened from side to side and much flattened antero-posteriorly. The lower end of the sternum in these cases is situated at the bottom of a deep hollow, so that in severe degrees its posterior surface comes very near to the front of the vertebræ, and the cyrtometer tracing has a kidney-shaped outline. The causation of this deformity is obscure, but it evidently arises from some long-continued abnormality of muscular action. Its shape reminds one of the temporary

flattening with sternal retraction which is seen in some cases of paralysis of the diaphragm.

The characteristic barrel-shaped chest of asthma often develops markedly in childhood.

Many children show a combination of these types of thoracic deformity.

It is not uncommon to find noticeable retraction of one half of the chest from old pleurisy or collapse, or evident bulging of the left side of the thorax in front, from a hypertrophied heart.

It is to be remembered that all these deformities of the thorax have a strong tendency to diminish when their causes cease to act and the chest grows larger. This tendency towards recovery can be materially increased by judicious breathing exercises and the use of dumb-bells, musical drill, etc.

Considerable enlargement of the superficial veins over the upper part of the chest is a common symptom of enlarged bronchial glands as well as of intra-thoracic tumours.

Congenital Unilateral Pectoral Defect.—On examining the chest we occasionally find congenital defects of one kind or another. The most interesting of these is what may be referred to as "congenital unilateral pectoral defect." It is a condition which the practitioner ought to know about, as it is not extremely rare and may be misinterpreted.

This abnormality consists in atrophy or absence, on one side, of the various structures which normally occupy the pectoral region and its immediate neighbourhood. The greater and lesser pectoral muscles are either quite absent or partly so, and the subcutaneous fat over them is also scanty compared with that on the normal side. The mamma is usually absent or very small; and sometimes, as in Fig. 78, there is no trace of a nipple. In fully a quarter of the

reported cases[1] there is also a defect in the framework of the chest which implicates the ribs and cartilages, and sometimes the adjacent margin of the sternum. This is generally situated somewhere between the second and fifth ribs (Fig. 77); the first rib and the clavicle are never affected. The size and shape of the opening in the chest wall varies in different cases, but it always occupies an area which might be covered *in utero* by the child's fist or forearm if the elbow were flexed. It is interesting in this connection to note that in about one in seven of the reported cases there was some deformity of the hand or forearm of the affected side. This almost always consists in dwarfing of the hand with webbing of the fingers.

FIG. 77.—Congenital Defect of Pectoral Muscles and Chest Wall. Boy aged 5 years.

The *pathology* of this malformation of the pectoral region is obscure. The lesions correspond to nothing found in the normal course of development, nor can they be attributed to any central lesion of the nervous system. It seems almost certain that they must have originated *in utero* as the result of some localised pressure of an unknown nature.

The *diagnosis* rarely presents any difficulty to those who are acquainted with the condition. I have, however, known the

[1] John Thomson, "On a Form of Congenital Thoracic Deformity," *Teratologia* (*Quarterly Journal of Antenatal Pathology*), Edinburgh, Jan. 1895, p. i.

FIG. 78.—Congenital Pectoral Defect with absence of nipple on left side.

FIG. 79.—Pseudo-hypertrophic Paralysis. Early case in boy of 5 years. Showing defect of pectoral and latissimus dorsi muscles, greatest on right side.

defect put down to an old pleural attack or to an injury. Occasionally, congenital pectoral defect is simulated by the atrophy of the lower segment of the pectorals which occurs in some cases of pseudo-hypertrophic paralysis. This in rare instances (as in Fig. 79) is much more marked on one side than on the other. In such myopathic atrophies the pectoral on the opposite side is always affected to some degree, the posterior axillary wall is also usually implicated as well as the anterior, and the skin over the atrophied pectoral is not tight, as in the congenital defect, from atrophy of the subcutaneous tissue.

The *prognosis* as to usefulness of the arm on the side affected is good, provided the hand is normal. The deformity interferes very little with the patient's capacity for ordinary work.

No *treatment* is indicated.

Movements of the Chest.—The respiratory movements of the chest are slight in infants, because the type of respiration in them is almost entirely abdominal. It is important to notice not only if the two sides move equally, but also if there is any indrawing of the epigastrium and adjacent parts on inspiration. Such indrawing indicates that sufficient air is not entering the chest. The significance of the fact varies according to the circumstances under which it is met with. Thus in extreme rickets it may be largely due to the abnormally collapsable character of the chest wall, and indicate no urgent risk. With a tolerably normal chest, however, retraction of this part of the chest wall becomes a symptom of serious importance. When it is met with in broncho-pneumonia, its amount helps us to gauge the extent to which the lung is affected, while in croup its presence to any marked degree is one of the main indications for immediate surgical assistance.

In watching the respiration, it is well to note if the

normal bulging of the upper part of the abdomen occurs with each breath. If instead of this there is sinking in of this region with inspiration, this is probably due to paralysis of the diaphragm—a dangerous condition generally caused by diphtheritic paralysis.

The movements of the alæ nasi should also be noted. In any case of dyspnœa from a serious organic disease (such as pneumonia or croup) these are greatly exaggerated, and if, with stridulous or rapid breathing, there is no increased action of the alæ, it is a somewhat reassuring sign. In judging of the movements of the alæ nasi in a case, we have, of course, to take into account the development of the nostrils in the patient. In some children the muscles of the nose are much more strongly developed than in others. When there is severe dyspnœa in infants, our attention may be called to the fact that they cease to be able to take the breast, owing to the difficulty they have in holding their breath while sucking.

Palpation

In examining the lungs it is important to ascertain at an early stage the position of the *heart's apex beat.* Should this be found displaced to one or other side, as often happens in pleurisy with effusion, in collapse, or in conditions of fibrous overgrowth of the lung, it may at once throw considerable light on the diagnosis and shorten the subsequent examination.

In cases of acute lung disease, the state of the heart, as to strength or weakness or dilatation of its right side, is often more important from the point of view of prognosis and treatment than is the exact state of the lung.

Vocal fremitus is sometimes difficult to obtain in children, owing to the quality of the child's voice and to his unwillingness to speak loud. Sometimes it may be got when he is crying. While we can never count on getting it, it may

be of great help when obtained. Rhonchal fremitus is very easily observed in many cases of bronchitis.

Auscultation

If little children are frightened, they sometimes hold their breath when you try to auscultate them, and will not inspire freely. This may delay our examination, but is, in a way, reassuring, as it proves that there is no serious lung disease.

Crying is, of course, a common interruption to auscultation. It is not, however, nearly so troublesome as might at first sight appear. Crying makes the child take long deep breaths, and therefore causes any accompaniments that there may be to be more clearly audible. Similarly, the auscultation of the heart may sometimes be carried out fairly satisfactorily when the child is crying—provided always that the crying is vigorous—because in the pause between the cries there is time for one or two cardiac revolutions to take place. Should the crying be of the nature of whimpering or suppressed sobbing, the interference which it causes to auscultation is much greater.

The child's chest has great powers of conduction, so that one hears the heart sounds at the back comparatively well without any consolidation of the lungs being present, and crepitations which are produced in one lung may be heard clearly on both sides.

The *breath sounds* in young babies are naturally very weak, owing to the feeble, shallow nature of the breathing. As the child grows they get gradually stronger, and about the age of six months they acquire the peculiar harsh character known as *puerile.*

In older children, *abnormal weakness* of the breath sounds is an important sign. We meet with it in the early stages of pneumonia, in pleuritic effusion, in collapse

of the lung, and in pneumothorax. It is also met with sometimes in cases with great thoracic deformity, and is then due, apparently, to local emphysema. If, on auscultation, the breath sounds are found to differ in loudness on the two sides, the side with the weaker breathing is almost invariably the abnormal one. Areas of weak breathing which pass off rapidly are sometimes found in children, due apparently to temporary collapse of a portion of lung from blocking of the bronchus with mucus.

Tubular breathing is more often met with in pleurisy with effusion in children than in adults, and it sometimes leads to a mistaken diagnosis of consolidation. When a large area of solid lung is present on one side, the tubular breathing to which it gives rise may sometimes be heard so plainly over parts of the other, normal, lung as to be very misleading. In pleurisy in young babies we sometimes fail altogether to find *friction* sounds. In such cases we have to depend on the catch in the breath and evident accompanying pain which we observe when the child inspires deeply or attempts to cry.

A peculiar alteration of the rhythm of the breathing is frequently met with in children, and is sometimes perplexing to beginners. In ordinary respiration we have inspiration followed by expiration; then a pause; then inspiration again, and so on. In the peculiar breathing referred to, there is first a long loud expiration, the noise of which sometimes amounts to a sort of grunt. This is followed immediately by a short inspiration; then there is a pause; then expiration begins again, and so on. This peculiar breathing with *expiratory rhythm* is heard in its most marked degree in commencing pneumonia. A certain degree of it, however, is often observed in little children with perfectly healthy lungs—especially if they are apprehensive or frightened.

Vocal resonance often cannot be obtained in the usual way

by making the child speak, but the cough or the cry may be sufficient to elicit it.

Percussion

In order not to hurt or frighten the child, percussion should always be light; if strong, it is apt to mislead by bringing out dulness or resonance, as the case may be, from underlying organs. It is essential *to see that the patient is sitting straight*, because even a slight twist of the spine may give rise to a distinct difference in the percussion note on the two sides of the chest. Marked alteration of note may be produced by variations in the curve of the chest wall; so that in a deformed chest local impairment of the percussion note may be found which is not due to any change in the lung, but merely to a sharper curve of the ribs.

Slight areas of dulness may be due to small pieces of collapsed lung, or to the result of old pleurisies. In any case, a slight amount of impairment, apart from any other sign or symptom, is not in children to be regarded very seriously. On the other hand, even when fluid is present in the pleura, there is often less absolute dulness in children than might be expected; and sometimes patches of consolidated lung give very little dulness, owing to their being surrounded by emphysema. Dulness over the manubrium sterni, and extending to either side of it for some distance, is one of the signs of enlarged bronchial glands. Owing to the yielding nature of the chest walls, a well-marked *cracked-pot sound* can often be obtained in little children who have perfectly healthy lungs—especially when they are crying. When acute pleurisy is present, there may be considerable tenderness on percussion over the part.

Sputum

It is only when children are between five and seven years old that they begin to expectorate naturally. Before

that age, unless they have been taught otherwise, they swallow the sputum. If it is important to examine it, it may be obtained from the stomach by passing an œsophageal tube. Sufficient sputum for examination may, however, often be procured by passing the tongue depressor back so as to touch the epiglottis or pharynx, and so start a cough. Any expectoration there is, is then thrown on the pharyngeal wall, and may be collected on a little swab of absorbent wool before the child can swallow it.[1] Another even simpler way consists in introducing the index finger over the epiglottis so that it lies over the glottis. The child will usually cough, and a little sputum will adhere to the point of the finger.[2]

Real *hæmoptysis* is comparatively rare in childhood. It does not occur, as in adults, as an early symptom of pulmonary phthisis, and is only rarely met with in the late stage of that disease. It sometimes takes place in pulmonary gangrene. When a young child spits up blood, it is generally, however, owing to the violence of the cough, as in pertussis, and the blood generally comes from the throat, nose, or gums.

Very fetid sputum is characteristic of gangrene of the lung. This sometimes occurs in the acute pneumonia of cachectic children and sometimes in advanced pulmonary tuberculosis. Fetid sputum may also, however, be due to an ulcerative condition of the gums. In bronchiectasis in young children the sputum has often no offensive odour.

The Larynx[3]

The upper aperture of the larynx at birth differs little in contour from that of the adult (Fig. 80). Its structures, however, are much softer and more collapsable, so that they tend to be frequently sucked together by the irregular jerky

[1] Variot, *Bull. de la Soc. de Pédiatrie de Paris*, Jan. 20, 1903, p. 13.
[2] Netter, *ibid.* p. 14.
[3] Thomson and Turner, *British Med. Journ.*, Dec. 1, 1900.

inspirations of the young infant. This soon results in a change of form of the part, and it assumes the infantile type (Fig. 81), which is found in a varying degree in all young infants who have breathed. In it the epiglottis is distinctly gutter-shaped on its posterior aspect, while the soft and yielding ary-epiglottic ligaments are approximated to one another so as to narrow the upper aperture. This narrowness of the orifice and the softness of its walls have to do with the readiness with which crowing occurs on slight occasion in young babies.

As the child grows older the parts become more rigid,

Upper Aperture of the Larnyx at Different Ages.

Fig. 80.—At birth.

Fig. 81.—At 3 months.

Fig. 82.—At 7 years.

Fig. 83.—At 9 years.

and gradually in most cases assume the adult type (Figs. 82 and 83). Occasionally, however, the infantile type persists in some degree even into adult life.

Laryngoscopy.—In new-born children it is generally difficult even for expert laryngologists to see the vocal cords. In infants of a few months old it is often found almost or quite impossible to get a view of them, owing chiefly to the extreme readiness with which stomach contents and mucus are brought up on any attempt to introduce a laryngeal mirror. A view of the epiglottis is very often all that can be obtained. Sutherland and Lack,[1] however, describe as

[1] *Lancet*, Sept. 11, 1897.

follows a method by which they claim that the young infant's larynx can always be seen "without causing it any pain or inconvenience." "The infant being held in the usual position for laryngoscopy, the index finger of the left hand is passed into the mouth over the base of the tongue, and the terminal phalanx hooked round the hyoid bone, which is by this means pressed well forward. The rest of the finger holds down the tongue out of the way, and, with the left thumb pressed up under the chin, serves to steady the infant's head. A small laryngeal mirror is now introduced in the usual way, and the larynx comes readily into view."

In older children who are nervous, laryngoscopy is rendered more easy if a little chloroform be given—just enough to make the child very drowsy.

The Breathing

The respiration "in very young children is peculiar in being irregular in rhythm and in force, as if the co-ordination involved in its movements were not as yet under full control. There often occur, therefore, relatively sudden respiratory efforts. When a young baby is excited, it is no uncommon thing for it to develop a temporary crowing noise with inspiration, although it has none at other times. A similar, but louder and more persistent, crowing, which indeed exactly resembles that in a case of infantile stridor, is not infrequently observed in young infants while they are beginning to come out of chloroform narcosis; and a very loud crowing is a common accompaniment of operations on the genital organs, owing to the sudden forcible inspiration which the stimulation of the nerves of these parts is apt to occasion. Along with crowing there is always a degree of indrawing of the lower chest wall proportionate to the loudness of the sound."[1]

[1] Thomson and Turner, *loc. cit.*

Rate and Rhythm of the Respiration.—In young infants the rate of breathing is so variable that it is difficult to estimate it correctly. It is best counted during sleep, and we should take the average of several minutes. At birth the number of respirations per minute varies from 32 to 50, and during the first year from 25 to 35. During the second, third, and fourth years it is about 25 per minute. In children of seven or eight the rate is still higher than in adults. Like that of the pulse, the rate of the respiration varies greatly, not only with the body temperature but also with the mental state.

Very irregular respiration in children is sometimes seen in cerebral disease, and may be an important aid in the diagnosis.

Pulse-respiration Ratio.—The important part, however, to determine about the breathing is not its actual rate so much as the ratio between it and the pulse rate. The *pulse respiration ratio* should in health be 1 to $3\frac{1}{2}$ or 4; and any great disturbance of these proportions is of clinical significance. A markedly increased rate of breathing accompanied by dyspnœa usually signifies pulmonary disease, and is often of great use in the diagnosis of early cases. There are, however, certain fallacies which have to be guarded against. Thus, increased rapidity of breathing may occur without pulmonary disease in children who have extremely rickety chests, or in whom there is great abdominal distention, and also in peritonitis. Some children also, as Henoch has pointed out, have during the state of nervous irritability accompanying teething a respiration rate of 60 to 90 per minute without any adequate local cause; but in those cases there is no severe respiratory distress. Rapid breathing is also seen in cases of lithæmia, in certain forms of asthma, and sometimes in cases of whooping-cough in which the lungs are not seriously affected. It is a noticeable feature in many cases of acute cerebro-spinal meningitis.

Sound of the Breathing.—A good deal can often be made out about the state of a child's respiratory passages by listening to his breathing, his cry, and his cough.

Snuffling breathing indicates some obstruction of the nasal passages. It often occurs in young infants from ordinary catarrh, to which they are very liable. When, however, it persists for a long period, or occurs apart from other catarrhal symptoms, it always suggests the presence of syphilis. "Snuffles" is one of the most constant symptoms of congenital syphilis, and usually appears before the rash. Sometimes it is very slight in degree, and it may be inaudible unless the child's mouth is closed. In cases of bronchitis and pneumonia the presence of recent nasal obstruction from any cause constitutes a very serious complication.

Snoring during sleep, with noisy breathing while awake and a nasal tone of voice, commonly indicates the presence of enlarged tonsils or adenoids, but in rare cases may be due to diphtheritic paralysis of the palate. *Noisy breathing with dyspnœa* chiefly during inspiration, and a cry which is nasal but not generally hoarse, is characteristic of retropharyngeal abscess, and calls for an immediate digital examination of the pharynx.

Deep *sighing* occasionally occurs in little children without meaning much, but it is an important symptom in the prodromal stage of tuberculous meningitis. Sighing breathing is also characteristic of over-distention of the right side of the heart. Reference may also be made here again to the "grunting" noise which accompanies the dyspnœa of pneumonia, and to a somewhat similar noisy breathing with expiratory rhythm sometimes noticed in cases of masturbation in babies. Noisy, gasping respiration is found in certain toxæmic conditions (in diphtheria, influenza, etc.) before death, and seems to indicate the formation of an ante-mortem clot

in the heart. Dr. Lees has drawn attention[1] to a marked deepening of the inspirations, resembling the "air-hunger" of diabetic coma, which occurs in children who are taking large doses of salicylate of soda, and which calls for the immediate stopping of the drug.

Laryngeal or stridulous breathing indicates either organic or spasmodic narrowing of the windpipe, and is met with in true and false croup and in other forms of laryngeal obstruction (*e.g.* polypi). In young babies it is most frequently due to congenital laryngeal stridor (infantile respiratory spasm), but may be due to laryngeal papillomata or to tracheal obstruction from enlarged glands.

Bronchial wheezing is often readily audible not only in regular asthma but also in many cases of bronchitis of the larger tubes.

The Cry

Much may often be learned from the character of a child's cry. From its *loudness* we can gauge his strength to a certain extent; and if he cries loud and long, we may also be almost, though not quite, sure that he has no serious acute condition of his lungs and bronchi. If a child with dulness over part of the chest cries loudly, this is a point in favour of his having pleural effusion rather than pulmonary disease. Occasionally, however, children with pneumonia do cry loudly.

It is also very important to notice whether the cry has the *normal clear character*. A hoarse laryngeal cry in infants of a few weeks old is nearly always a symptom of congenital syphilis.

The Cough

Coughs vary much in significance and in character. While the presence of a cough naturally draws attention to the respiratory tract, it may prove to be due to some morbid

[1] *The Treatment of Some Acute Visceral Inflammations*, London, 1904, p. 10.

condition elsewhere (*e.g.* of the ear, brain, heart, or stomach). When from the respiratory tract it is oftener a sign of irritation about the pharynx and its neighbourhood (tonsils, uvula, adenoids) than of disease lower down.

The character of the cough is sometimes useful in indicating its source. It is loud and clanging at the beginning of an attack of croup, and husky and stridulous at a later stage. In bronchitis it is often deep and harsh. In pneumonia, with accompanying pleurisy, it is suppressed and painful. If a child coughs loudly without wincing, you may be sure that he has not got acute pleurisy. A very annoying and persistent cough sometimes occurs in commencing pleural effusions secondary to chronic lung disease. Measles, in its early stage, is a very common cause of constant uncontrollable coughing. When a child suffers from a loud noisy cough on lying down at night, and also when he awakes in the morning, although he is not much troubled during the day, he probably has a catarrhal condition of his throat with or without dyspepsia.

Often the cough has a distinctly paroxysmal character. This is most marked in whooping-cough, but is also noticed to a less degree in severe bronchitis. A similar cough is characteristic of some cases of empyema, of enlarged bronchial glands, and of adenoids. If, however, a child has a cough which is worse at night, which occurs in paroxysms, and often ends in vomiting, this almost certainly indicates whooping-cough. Should there be a noticeable puffiness about the eyelids or an ulcer under the tongue, the diagnosis is strongly confirmed.

Treatment of Cough.—In the majority of cases the only treatment for cough is that of the morbid condition which is causing it. Where this cannot be ascertained, however, we must treat the cough as a symptom. For this we may use, internally, such sedatives as heroin, antipyrin, or butyl chloral.

We may also sometimes obtain considerable relief from a large linseed and mustard poultice applied round the chest, or a small mustard plaster over the root of the neck. The administration of hot drinks and the use of a steam kettle are also to be recommended.

Sneezing

Sneezing is, of course, a common symptom of ordinary catarrh, and is marked in some forms of influenza. Severe sneezing with other catarrhal symptoms should always suggest the possibility of commencing measles. If the symptom occurs during the early summer in children over five years belonging to the upper classes, and if it persists obstinately, it may indicate the beginning of hay fever.

Hiccough

As hiccough is a spasmodic affection of the diaphragm, it may be dealt with here, although as a symptom it is most closely connected with the digestive organs. It is sometimes met with in children, as in adults, in the last stage of serious diseases of the alimentary system, such as appendicitis and peritonitis, and also in various diseases of the nervous system.

Generally, however, we meet with it as a normal phenomenon in healthy infants. According to Thévenet,[1] it is especially frequent in breast-fed babies during the first three months of life. It becomes less common as they grow older, and is rather rare by the end of the first year. It is less frequently seen in bottle-fed infants, and tends to occur later in them. It usually takes place after a meal, and under these circumstances is altogether normal, and may be regarded as the sign of a satisfied stomach painlessly digesting a copious meal. It does not occur when the stomach is empty. The administration of more food checks it. If the digestion is

[1] *Lyon. méd.*, Aug. 27, 1905.

disturbed it ceases, and only returns when the derangement passes off. Hiccough, in babies, often follows regurgitation and sometimes comes after vomiting, but it never precedes them. Its occurrence is, therefore, a reassuring sign, as it indicates that the last meal taken is going to be retained.

When it occurs in older children in apparent health, it has no special significance.

CHAPTER XV

ON CERTAIN RESPIRATORY DISEASES IN CHILDREN

Croupous Pneumonia

Croupous pneumonia may occur at any age, but it is more frequent after the second year than in young babies. It is generally met with as a primary disease, and is almost always accompanied by a certain amount of pleurisy.

Symptoms.—The child takes ill suddenly, and generally the earliest manifestations of the disease are not respiratory symptoms, strictly speaking. In many cases the attack is ushered in by vomiting or diarrhœa. Headache also is frequent, and convulsions occasionally occur; rigors are not common in pneumonia, and only occur in older children. From the beginning the child is generally prostrated. Cough is not usually a prominent symptom, and it is apt to be suppressed as much as possible because of the pain which it causes. The character of the sputum rarely gives any assistance, because it is only in older children that a specimen of it can be easily obtained. Herpes round the mouth is frequent, and a vivid flush is common on one or both cheeks. Sometimes severe localised pain is complained of, and when present its situation may be useful in fixing the position of the lesion. Pain from the base may, *e.g.*, be felt in the shoulder or in the abdominal wall. When the right base is affected the symptoms occasionally simulate those of appendicitis very closely.

The breathing is characteristic in various ways.[1] Increased rapidity may not be present when the temperature first rises, but usually it is marked before the physical signs develop. The respirations are generally 50 to 60 or more in the minute, even if only a small portion of the lung is affected. The breathing is also shallow and comparatively easy. It is chiefly abdominal, while in broncho-pneumonia and bronchitis the thoracic type very markedly predominates. Another characteristic peculiarity of the breathing is its expiratory rhythm (p. 262), and it is often accompanied by noisy grunting expiration. The pulse respiration ratio is altered (p. 267).

The temperature curve in children over three years is much as in adults, showing a sudden rise, a continued type, and a complete crisis. The crisis generally occurs between the fifth and ninth days, but it may set in as early as the second or third. It is not infrequently deferred considerably beyond the usual date, owing to the disease spreading and fresh areas of the lung tissue being affected. In young children marked remissions are often seen toward the end of the fever, and all varieties of ending are seen between a typical crisis and a regular lysis. If the temperature keeps up, or if it rises again after it has fallen, empyema should be suspected.

The frequency and prominence of cerebral symptoms in pneumonia in children, especially when the apex is affected, is a fact of great practical importance. When these are marked and the chest signs are slow in showing themselves, there is a considerable risk of the case being mistaken for one of brain disease. Sometimes, indeed, it is very difficult to be sure whether the cerebral symptoms accompanying an undoubted pneumonia do or do not indicate the presence of

[1] For an account of pneumonic breathing and an interesting discussion of its causation, see paper by Dr. G. A. Sutherland in *Clinical Journal*, Oct. 25, 1905.

meningitis also. In most cases this is not so, but occasionally pneumococcal meningitis occurs as a complication of pneumonia. In doubtful cases we may have recourse to lumbar puncture.

The physical signs of pneumonic consolidation are the same in children as in adults. They are generally distinct by the fourth day; but in some cases careful and repeated examination fails to discover them until the sixth or even seventh day. In such cases the acceleration of the breathing is usually also long of beginning. In children who are very feverish, with digestive disturbances and irritation about the gums, one should always suspect the possible presence of a patch of pneumonia and examine repeatedly for it.

Complications are not uncommon. Of these, empyema is the most important. Pneumococcal otitis and rhinitis are very common, and the irritation caused by their discharges sometimes sets up a troublesome pustular dermatitis. Pericarditis is rare in older children. In young infants it is not uncommon as a cause of death; generally it gives rise to no friction sounds. Pneumococcal meningitis and peritonitis occasionally occur. Gastro-enteritis, nephritis, and arthritis are sometimes seen, and, in cachectic children, gangrene of the lung may be met with.

The **prognosis** in croupous pneumonia is very favourable, considering how ill the child generally seems to be. Unless he is very feeble, or the disease complicated, or a large area of the lung or lungs affected, the case is almost certain to end in recovery. When death occurs in simple pneumonia, it is nearly always due to heart failure. The importance of the characters of the pulse in the prognosis of cases of pneumonia has already been dwelt upon (p. 237).

In some children pneumonic consolidation persists for many weeks or even for months, and after arousing strong suspicions

of tuberculosis, clears up entirely. Children are sometimes met with who have a special liability to pneumonia, and who, during their short lives, have had three or four attacks.

Treatment. — In the majority of cases of croupous pneumonia in children no special treatment is called for. The disease is self-limited and has a strong tendency towards recovery, and its course cannot be shortened by anything we can do. All that is usually necessary is that the child be kept lying in bed in a thoroughly well-ventilated room, and be regularly and judiciously fed and nursed. Overfeeding is to be carefully guarded against, alcohol is generally not needed, and sitting up is to be forbidden. Complications and special symptoms are to be watched for and treated as they arise. The main symptoms which require active treatment are : specially high temperature, pain, sleeplessness, cough, and threatening heart failure.[1]

(*a*) *Pyrexia.*—Generally the fever in pneumonia requires no special treatment. If the temperature, however, remains for long over 104·5, or if hyperpyrexia sets in at any stage, something must be done to reduce it. Otherwise, in the former case there is danger of the heart muscle suffering, and in the latter of convulsions setting in. A specially high temperature sometimes occurs at the beginning of the attack, and this is often best treated by a dose of Dover's powder. At a later stage opium is particularly to be avoided, and the administration of alcohol along with tepid sponging or a cold pack is indicated. Dr. Coutts strongly recommends a rectal injection of cold water (75° F.). Antipyretic drugs are to be used with caution. Antipyrine (gr. i) and quinine (grs. ii to iii for a child of a year old) are probably the safest and best. These antipyretic measures are only to be used to bring an excessive

[1] J. A. Coutts, "Some Observations on the Occurrence and Treatment of Lobar Pneumonia in Young Children," *Ed. Med. Journ.*, Sept. 1902.

temperature down a few degrees. Any attempt to cut short the fever by means of drugs is dangerous as well as useless. Prolongation of the pyrexia and hyperpyrexia may both be attributable to otitis media.

(*b*) *Pain.*—This is generally best treated by a linseed poultice with or without mustard, or by hot fomentations. Severe pain at the beginning in older children generally yields rapidly to a dose of Dover's powder. The application of two or three leeches, or wet-cupping over the affected region, are often also successful in relieving pain.

(*c*) *Insomnia.*—In the early stages, in older children, Dover's powder is also most effective for this symptom. Later, if the patient is collapsed, alcohol is indicated. If the pulse is fairly good, antipyrin may be used cautiously, and is sometimes very effectual. Often, especially in young children, the sleeplessness arises from the state of the bowel, and a warm enema or a dose of castor oil or calomel forms the best treatment.

(*d*) *Cough.*—This may be treated by poultices or by the use of a steam kettle. Should bronchitis be present, as happens much more frequently in children than in adults, an ordinary ipecacuan and ammonia cough mixture, with or without a *few* doses of paregoric, may be tried.

(*e*) *Heart Failure.*—This must be energetically dealt with by alcohol, strychnine, ammonia, and ether. Digitalis and strophanthus are often also of great value.

When the right side of the heart shows signs of dilatation and the liver is enlarging from passive congestion, venesection, or the application of three or four leeches over the præcordia or right hypochondrium, is of the greatest value and should always be had recourse to. A calomel purge is often a useful auxiliary measure. The inhalation of oxygen is sometimes recommended; it has not, however, in my experience been of much service.

Broncho-Pneumonia

Broncho-pneumonia may occur as a primary disease, or it may be secondary to such infectious diseases as whooping-cough, measles, influenza, and diphtheria, or to gastro-intestinal disorders. It is the form of pneumonia which occurs in early infancy, and about 75 per cent. of all the cases occurring in children under two years are said to be of this type. After four years, broncho-pneumonia is rarely met with as a primary disease (Holt). Debility is another influence which predisposes to the occurrence of this form of inflammation of the lungs.

Symptoms.—The mode of onset varies considerably in different cases. Generally the disease sets in as the culmination of a bronchial attack; often, however, the pneumonic symptoms come on quite suddenly without previous bronchitis, and we have high fever, vomiting, and sometimes a convulsion as in croupous pneumonia. The symptoms, however, are usually much more obviously pulmonary in character in this kind of pneumonia. The respiration is very rapid and laboured, and it has a markedly thoracic type; there is also more or less inspiratory indrawing of the lower lateral regions of the chest wall. Cough is generally present—shallow, short, and hacking in character. The child is usually too ill to sit up or speak, and he gets short of breath upon the least exertion. Cyanosis is noticeable in severe cases. The fever lasts for from one to three weeks, and the temperature curve shows a remittent type and generally ends by lysis. The rise of the temperature may be very slight, especially in young and delicate children.

The physical signs are often quite indefinite at first—not differing from those of bronchitis of the smaller tubes. There may be no definite evidence of consolidation at this stage, the patches being too small to cause either dulness or bronchial breathing. After a time, however, bronchial breathing,

characteristically sharp râles, and an impaired percussion note develop.

Complications.—Pleurisy is a less invariable occurrence in broncho-pneumonia than in the croupous form of the disease. It is met with, however, in most cases where the lung is extensively involved, and it may go on to empyema. Collapse and emphysema frequently occur, and gangrene of the lung is not very rare.

Diagnosis.—Broncho-pneumonia is to be distinguished from bronchitis by the general symptoms rather than by the physical signs. The higher range of the temperature, the greater rapidity of the breathing, the shorter and shallower nature of the cough, the greater prostration, and the marked cyanosis, are all characteristic of the graver disease.

In young children it is sometimes very difficult to decide which variety of pneumonia is present, and pathological experience teaches us that both forms may be present at the same time and even in the same lung. Generally we are helped in our diagnosis by considering the patient's age and strength. Young and feeble infants are more likely to have broncho-pneumonia. The temperature chart is also very helpful—a gradual onset, an atypical curve, and an ending by lysis are all in favour of broncho-pneumonia, although by no means pathognomonic. When much bronchitis is present, and when both lungs are affected, these points are also, so far, in favour of the diagnosis of broncho-pneumonia.

It is sometimes difficult to diagnose broncho-pneumonia from collapse, and to determine, when both are present, what proportion of the symptoms are attributable to each. Simple atelectasis is characterised by a low temperature, more or less marked cyanosis, and generally very indefinite physical signs.

It may be quite impossible to discriminate, at an early stage, between an attack of simple and one of tuberculous

broncho-pneumonia. The symptoms and physical signs may be practically identical in the two conditions. The occurrence of previous wasting, and especially the history of an attack of measles or whooping-cough shortly before the present illness, is certainly suggestive of tuberculosis.

Prognosis.—In estimating the prognosis in a case of broncho-pneumonia, we must take into consideration the following points:—

(*a*) The child's age—the younger he is the more serious is the case;

(*b*) The state of his nutrition—the chances are far better in breast-fed than in bottle-fed babies;

(*c*) The state of the pulse—if the tension is low, it is a very bad omen;

(*d*) The form and consistence of the chest wall—weak muscles and a soft-walled or deformed thorax greatly increase the danger;

(*e*) The extent of lung involved;

(*f*) If the pneumonia is secondary, the nature of the primary disease is important—*e.g.* an attack of broncho-pneumonia after measles is much more likely to be fatal than a primary attack of apparently equal severity.

Treatment.—The main indications are as follows:—

(*a*) *Keep the patient warm* in bed and supply him with *plenty of fresh cool air.* The old-fashioned plan of having the windows shut for fear of a draught is a serious mistake. Draughts can easily be kept off by the use of screens, and so long as the child's extremities are warm, he will (if he has no laryngitis) get nothing but good from abundance of cold fresh air.

The very great value of fresh air in the treatment of this disease was forcibly pointed out in 1904 by Dr. Claude B. Ker, in an important paper on the results of open-air treatment in the management of broncho-pneumonia compli-

cating whooping-cough.[1] The subject has also been dealt with in recent years in America by Northrup,[2] Burt,[3] and others.

When the windows are opened the appetite and digestion improve, and, with them, the general strength. The nervous tone is also better, and the child is less fretful and sleeps far more, and more soundly.

(*b*) *Avoid embarrassing the respiration* by heavy or tight clothing, and *encourage expectoration.* The continuous application of heavy poultices is not advisable; but an occasional mustard poultice (p. 216), followed by a light cotton-wool jacket, is often very useful. A simple alkaline expectorant mixture (F. 15) is usually distinctly helpful in rendering the phlegm more liquid and the cough easier. Moistening of the air by the use of a steam kettle or by hanging towels wrung out of hot water about the room is also sometimes useful—mainly if the upper air passages are affected. In fairly strong children with slight pneumonia and much bronchitis, an occasional emetic may help very considerably, but often the patient is much too weak for such treatment. Opiates and most other sedatives are strongly contra-indicated. The administration of large doses of extract of belladonna (gr. $\frac{1}{4}$ every three or four hours), as recommended by Dr. Coutts,[4] has occasionally in my experience been very useful.

(*c*) *Conserve the general strength* in every possible way. Do not upset the digestion by overfeeding; give liquid food in small quantities at regular intervals. Keep the child lying flat, and if the case is a bad one, do not let him tire himself by any exertion that is not necessary. It is well, however, to have his position changed from time to time, and,

[1] *Scott. Med. and Surg. Journ.*, Jan. 1904, p. 33.
[2] *Med. News*, April 30, 1904, and *Med. Record*, Feb. 18, 1905.
[3] *Med. Record*, March 30, 1907.
[4] *Brit. Med. Journ.*, Jan. 28, 1899, p. 207.

in slight cases, to let him sit up a little so as to encourage free inspirations. It is particularly important never to weary the child by any unnecessary physical examination. For the same reason the clothing should be such that it can be removed for examination with as little exertion as possible on his part. If the child is weak, a cotton-wool jacket and an arrangement of shawls can often advantageously be substituted for a nightdress with sleeves.

(*d*) *Ward off collapse* by stimulant measures. In many cases, especially when secondary, alcohol is necessary. Digitalis, strophanthus, and especially strychnine, are often useful. Inhalation of oxygen is doubtfully beneficial. When collapse threatens, a mustard bath is often of the greatest service. Should the right side of the heart become dilated, leeching may be urgently called for. This is not, however, very often indicated.

(*e*) *Reduction of the temperature* is sometimes desirable if it continues high. For this purpose cold sponging is preferable to the use of drugs. Antipyrine and phenacetin may, however, sometimes be given with caution in fairly strong children. Antifebrin should never be used.

(*f*) *Make sure of a complete convalescence* by the use of tonics, and, if possible, by sending the child to the country for a time.

Collapse of the Lung

Collapse of the lung is a common and important incident in the course of all kinds of respiratory disease in infancy. It is also frequently found after death in those who have died from debilitating disease of any kind, although they may have had no pulmonary symptoms.

Causes.—The special tendency to the occurrence of collapse in young children is explained partly by the soft and yielding chest walls and weak respiratory muscles, and

partly by the fact that coughing in them is largely a reflex act, and is not aided, as in adults, by experienced voluntary efforts at expectoration. With these unfavourable conditions present, a smaller amount of bronchial secretion is sufficient to obstruct seriously the free entrance of air into the vesicles, and narrowing of the upper air passages, such as occurs from adenoids, is more apt to have a deleterious effect on the lung expansion. The occurrence of abdominal distention from tympanites or any other cause is another factor frequently present in childhood. Areas of pulmonary collapse may become reinflated with air, with or without treatment.

Symptoms.—The symptoms of collapse vary according to the amount of lung involved. If a large area is suddenly affected in this way in the course of an attack of bronchitis, the respiration becomes very rapid, rising perhaps to 70 to 90 in the minute, the alæ nasi work violently, cyanosis appears, and the child is greatly distressed. The cough is less loud and harsh than previously, and the child shows signs of exhaustion. The temperature does not rise as in pneumonia, and may even fall.

The physical signs also change. The lower part of the thorax and the interspaces over the affected area are indrawn with each inspiration. The breath sounds are feeble and distant, and tend to become bronchial in character. In many cases it is impossible to diagnose collapse of the lung with certainty during life, but it may often be advisable to employ suitable treatment for it before it can be diagnosed with absolute certainty.

Treatment.—In treating a case of pulmonary collapse, we aim at the reinflation of the collapsed areas. To this end we endeavour to remove all impediments to the breathing, we try to increase the force of the inspirations as well as the child's general vigour, and at the same time we aim at

diminishing the viscidity of the secretions and lessening the spasm of the bronchial walls.

The child should lie with the affected side uppermost, and his clothes should be light and lie loosely on the chest and abdomen. He should not be allowed to sleep long and soundly, but should be wakened from time to time and made to cry. The strength of his crying may be increased by the sudden application of cold cloths to his chest or by rubbing it with a stimulating liniment (F. 17). Easily absorbable nourishment, along with alcohol, ether, ammonia, strychnine, etc., should be given to sustain the general strength. To liquify the secretion a steam kettle and the administration of ipecacuanha and alkalies are useful, and belladonna may be given in full doses for the relief of spasm.

Pulmonary Phthisis

Pulmonary phthisis proper, apart from tuberculous broncho-pneumonia, from miliary tuberculosis, and from bronchial gland disease, is a comparatively rare disease in young children. When it does occur in babies, its chief peculiarities are that it more frequently begins in the lower lobes of the lungs than in older patients, and that its course is often very rapid. In older children, cases of phthisis of the ordinary adult type sometimes occur. A serious prognosis, however, should never be hastily given in cases of consolidation of the apex in children unless there are other serious indications of tubercle present. Many cases which give what would, if they occurred in adults, be regarded as tolerably certain physical signs of phthisis, clear up altogether in a few weeks under the influence of warmth, fresh air, nourishment, and tonics.

Pleurisy

Dry pleurisy and pleurisy with serous effusion, apart from pneumonia and tuberculosis, are very rare in early infancy.

In older children they are common, though less frequent relatively than in adults. Dry pleurisy is occasionally a rheumatic manifestation. The other causes are those met with in later life, and generally there is no important difference in the physical signs in children. The general symptoms, even when there is a large effusion, are sometimes surprisingly slight. Cases are not uncommon in which the pleural effusion takes the form of such a thick layer of solid lymph that the dulness resembles that in fluid effusion or pneumonic consolidation.

The *prognosis* is generally good, especially if there is reason to think that the case is not tubercular, but the recovery may be very slow. Even tuberculous cases often do well if the general conditions are favourable. The *treatment* does not differ from that in adult cases.

Empyema

Empyema is much commoner in children than in adults, and it is often more insidious in its onset and more obscure in its symptoms than in later life. In children also it is much less frequently tuberculous in origin, and it is more often met with in a loculated form.

Causes.—The general condition of the child's nutrition is of great importance in determining the occurrence of empyema. It occurs frequently among the ill-nourished children of city slums under circumstances in which it is rare among the upper classes or in country children. It is often the sequel of scarlet fever, measles, or some other infectious disease, and it occurs most frequently after acute pneumonia.

In children the exciting cause of empyema is the pneumococcus in a large majority of cases. Other pyogenic organisms, especially streptococci, are often to blame. The tubercle bacillus is rarely found.

Symptoms.—The symptoms vary in different cases. When the case occurs after pneumonia or one of the infectious diseases, there is generally a history of interrupted convalescence with return of the fever, usually some cough, malaise, loss of appetite, and so on. Often, however, it is difficult to get any account of a sudden commencement. In such cases the child is observed to fail in strength and appetite gradually; sometimes he vomits or his bowels are loose; sometimes he sweats much at night. Then he may develop a cough occurring in fits like whooping-cough. Sometimes there is a history of the child's being languid and hot at night, but often there is no fever noticed.

On examining the chest, if the collection of pus is small and localised, there may be found only a patch of dulness, diminished breathing, and defective resonance. This patch is oftenest found near the angle of the scapula, but it may be situated in any region of the chest, and occasionally occurs over the apex with resonant lung below it. If the pus is present in large amount, and is free in the pleural cavity, as is usually the case where the illness is of recent origin and has come on acutely, there is generally some bulging of the affected side with diminished movement. The heart may have been displaced by the pressure of the gathering fluid. In very chronic cases the affected side is sometimes shrunk, owing to the pulmonary collapse which is present, and the heart is drawn towards the affected side. The occurrence of empyema on both sides of the chest is not very uncommon. On palpation, auscultation, and percussion, we get the usual signs of fluid. The temperature may be raised, but it is frequently quite normal.

The only certain way of making a diagnosis, however, is to use an exploring syringe, and this should *always* be done if in doubt. If one puncture fails to discover pus where there is reason to expect its presence, the process should

be repeated (frequently if necessary) either at once or at intervals of a day or two. With ordinary aseptic precautions, no harm results from the puncture. The only accidents are severe hæmoptysis and cutaneous emphysema. The former I have only seen once and the latter in three or four cases. When emphysema takes place it begins round the site of the puncture. It occurs when the needle passes through air-containing lung tissue which is adherent to the chest wall, and it merely occasions a slight rise of temperature for a few days. Exploring for pus requires a larger syringe than that which is used for subcutaneous injections, and also a considerably larger needle than the ordinary hypodermic one. If the pus is thick, as it often is in chronic cases, an ordinary hypodermic syringe may entirely fail to reveal its presence.

Treatment.—The treatment of empyema consists, of course, in the speedy removal of the pus. It is generally well to begin by aspirating it. A single aspiration brings about recovery in a certain proportion of cases. If the collection is a small one, and it only slowly reaccumulates, a second aspiration may be tried. Generally, however, if one aspiration fails, the pleura should be incised. If the ribs are fairly wide apart, a simple incision and subsequent draining with an indiarubber tube will probably be the best treatment, especially if the child be very feeble. If the ribs are very close together, however, as they often are, so that there is little room between them for a small tube to lie in uncompressed, it will be well to consider the advisability of resecting a portion of a rib. This has the disadvantage of necessitating the use of chloroform (which is more dangerous in these cases than in almost any others in childhood), but it has great compensating advantages. It allows the masses of semi-solid purulent lymph, which are often found, to be more completely evacuated; it ensures free

drainage; and, last but not least, it makes the dressing a comparatively painless process, instead of a very painful one, as it is sure to be if the tube fits tightly between the ribs. Washing out the cavity is never advisable, except perhaps in cases where the pus is offensive in character, and these are exceedingly rare in childhood.

Bronchitis

Bronchial catarrh is extremely common in infants and young children, and is important, not only for this reason, but also because it is so liable in them to be complicated by collapse and broncho-pneumonia.

Causes.—Cold and damp are generally the *exciting causes* of bronchitis in children, and injudicious clothing and exposure are often to blame for it. In examining infants, therefore, we must always remember their great liability to suffer from chills, and we should not expose much of the surface of the body at a time, except in a warm room or in front of a good fire.

In many cases there are also important *predisposing causes* at work, and these have to be taken into account in the treatment. Rickets strongly favours the occurrence of bronchial as well as other forms of catarrh, and when we have bronchitis lasting long or frequently recurring, we often find that it is due to the presence of this disease. In such cases, the regulation of the diet, and other anti-rachitic measures, are of more importance in the treatment than cough mixtures and other remedies directed against the local malady; and some combination should always be used.

Even in children who are not rickety, the presence of teething seems sometimes to predispose to bronchitis, and the advent of each new group of teeth is accompanied by an attack. Another important predisposing cause of re-

current bronchial attacks is the presence of adenoid growths in the naso-pharnyx, and, as Lockhart Gibson and others have pointed out, the removal of these is often followed by comparative immunity from further recurrence of the bronchitis.

Symptoms.—The symptoms are much the same as in later life—a slight rise in temperature, a cough usually deep and loud, slight acceleration of the breathing, no dulness or bronchial breathing, loud sonorous rhonchi and bubbling râles if the larger bronchi are affected, and sibilant and crackling sounds if the smaller tubes are involved. They vary in severity not only with the size of the bronchi affected and the stage of the attack, but also with the strength of the patient. In wasted and weakly infants the symptoms are less severe, although the real danger is much greater, than in those who are robust. If the child's cough and cry are loud, the case is not yet a serious one.

Treatment.—In treating a baby with acute bronchitis there are two main indications. *Firstly*, the strength must be sustained, and depressing influences guarded against. The room should be kept at a temperature of 65° to 70° F., and well aired, but all draughts avoided. The diet must be as nourishing and digestible as possible, and if the baby is refusing food, or if the case is a severe one, stimulants may be advisable—alcohol, ammonia, digitalis, and strychnine.

Secondly, the patient must be assisted to get rid of the excessive bronchial secretion which constitutes an element of danger to him, by the secretion being rendered more fluid and the natural methods of its expulsion aided. This indication may be fulfilled in various ways—

(*a*) The air he breathes should be moistened by having a steam kettle playing close to his bed, or by hanging up near it from time to time ordinary towels wrung out of hot water.

(*b*) Hot fomentations may be applied to the chest if the

case is acute, or perhaps better, a mustard poultice followed by a cotton-wool jacket; or a stimulant embrocation (F. 18) may be applied.

(*c*) In the early stages small doses of ipecacuanha wine should be given with an alkali. Later, such stimulant expectorants as carbonate of ammonia and squills are indicated, and a sedative may sometimes be added with advantage (F. 16 and 19).

(*d*) When, in a strong child, the secretion is copious, and the patient is not vomiting spontaneously, an occasional emetic is of great advantage, and generally gives marked relief. If the baby can be made to vomit by tickling his fauces with a feather, this is sometimes better than giving an emetic.

(*e*) The baby's clothes must be warm, and should not be so tight as to interfere with the full play of his chest in breathing and coughing.

When the attack is over it is always very important to see that the child's health is thoroughly restored, and not to be contented with an incomplete convalescence. The use of cod liver oil and tonics and a change of air may be very desirable.

Bronchiectasis

Dilatation of the bronchi is a recognised complication in various organic diseases of the lungs and pleuræ in children. In many of these the condition is only recognisable after death. Typical cases of bronchiectasis, resembling those met with in adult life, are not at all rare in childhood, and are generally easy of diagnosis. Sometimes the disease sets in after an attack of measles or whooping-cough or some other acute affection. Sometimes it seems to develop independently.

The **symptoms** are the same as are met with in adult life. The cough is characteristically spasmodic, like that of whooping-cough, and is apt to be set up whenever the child assumes

certain positions. The sputum is also characteristic, very copious, of a greyish yellow colour, and with a peculiar sour and usually fetid odour. The characteristic sputum is apt to be overlooked at first, because the child swallows it. Sooner or later, however, sickness occurs, and the purulent sputum can then be recognised in the vomited matter. Blood is found in many cases in the sputum. The temperature is sometimes normal; usually, however, it is subject to periodic rises. The fingers become early and severely clubbed. In the later stages cyanosis usually develops. Patches of pneumonia are a common complication.

The physical signs are as in the adult. It is characteristic of them that they vary much from day to day. When one lung is badly affected, the physical signs are sometimes so freely transmitted across the chest that the other lung seems to be affected also.

The **treatment** of bronchiectasis is even more unsatisfactory in children than in adults. In them, thorough creasote inhalations and intra-tracheal injections of various kinds are inadmissible. When the expectoration is copious, some advantage may be derived from inverting the patient in the morning, so as to facilitate the emptying of the matter which has accumulated during the night in the bronchiectatic cavities.

If the sputum is offensive, turpentine may be given internally in doses of 3 or 4 minims three or four times a day. Generally, however, the only necessary treatment consists in close attention to the digestion and general health, in the administration of cod liver oil and tonics, and in arranging for the freest possible access of fresh air.

Asthma

Bronchial spasm is met with even in young infants, and is generally in them associated with a considerable degree

of catarrh. In older children more typical asthmatic attacks occur. The asthma is sometimes connected with the presence of adenoid growths, and often with dyspepsia; very often the child is also subject to eczema. A peculiar form of asthma is occasionally met with in babies and young children, in which the symptoms and physical signs closely resemble those of an acute attack of capillary bronchitis. "The onset is sudden, with moderate fever, incessant cough, severe dyspnœa, and sometimes symptoms of suffocation—cyanosis, prostration, and cold extremities" (Holt). The respiration may be extremely rapid, and the case looks like one of acute broncho-pneumonia. The threatening symptoms, however, pass off rapidly within forty-eight or even twenty-four hours. The rapid recovery and the recurrence of the attacks show their nature. The prognosis of asthma in childhood is generally better than when the disease begins in later life.

The **treatment** also is more successful, as a rule, and great improvement usually follows the use of iodide of potash, arsenic, and cod liver oil, along with careful attention to the naso-pharynx and to the digestion, and precautions against taking cold. When the disease occurs in young children, its severity and frequency may sometimes be greatly lessened by the treatment with salol and soda recommended for lithæmic conditions (Chap. XXII.). Oxygen inhalations are sometimes useful during the paroxysm.

Hay fever may begin in children of five or six years, and its symptoms are the same in them as in adults. Occasionally the onset of the disease is indicated by obstinately recurring epistaxis setting in in early summer, which in the following year is replaced by sneezing.

Enlargement of the Bronchial Glands

The bronchial glands are frequently enlarged in childhood. Generally, however, it is only at the autopsy that

this condition is discovered, as they generally cause no symptoms during life.

Occasionally, however, when very large they give rise to certain symptoms, owing to the pressure which they exert on neighbouring structures. Thus, pressure on the superior vena cava or the innominate vein may give rise to dilatation of the superficial veins of the face, neck, and front of the chest, or even to some degree of œdema; while implication of the nerves may cause asthmatic attacks, hoarseness of the voice, or a paroxysmal cough resembling whooping-cough. Sometimes, especially in babies, stridorous breathing is caused (p. 302). Rarely pressure may be exerted on a bronchus in such a way as to cause defective respiratory sounds over the lung area connected with it. When tuberculous bronchial glands soften, ulceration may take place into the bronchi, and death occasionally results from this.

When the enlargement is considerable, we may find dulness over the upper part of the sternum extending to either side of it. I have seen several cases in which enlarged bronchial glands led to a mistaken diagnosis of consolidation of the right apex. In such cases there is intense bronchial or even cavernous breathing over the dull area, with bronchophony, owing to conduction from a large bronchus.

In some cases, as Dr. Eustace Smith has pointed out, a loud venous hum is heard over the manubrium sterni if the child is made to throw his head back and look up to the ceiling. This sign may sometimes be very useful, but it is occasionally found in cases where the bronchial glands are not enlarged, and is often absent when they are.

Diseases with Laryngeal Symptoms

The main characteristic of laryngeal disorders in childhood is their tendency to be associated with spasm; and it

is chiefly the various forms of laryngeal and respiratory spasm that I wish specially to consider here. I shall not take up the important subject of laryngeal diphtheria. Simple acute laryngitis, also, which is not uncommon in childhood and which may be met with at all ages,—even occasionally in young babies,—need not be dealt with, as it does not differ importantly from the same condition in later life. Of chronic laryngitis the same may be said. It may, however, be repeated that when it is met with in early infancy it should always arouse suspicions of the possible presence of syphilis.

Laryngeal affections, owing to the noise they make, are always likely to be noticed early ; and they are apt to cause anxiety, because they suggest the question, "Has the child got croup, *i.e.* laryngeal diphtheria?" The most important causes of stridorous breathing in early childhood—apart from diphtheria and adenoids—are false croup, laryngismus stridulus, congenital stridor, and laryngeal papilloma.

False Croup (*Spasmodic Croup, Catarrhal Spasm, Laryngitis Stridula*)

This condition may occur any time between the ages of nine months and ten years, or later, but is commonest between two and six. Although it is not really a serious disease, it often gives rise to great anxiety.

Symptoms.—The onset of the attack is sudden, and almost always occurs during the night. The child, who has previously shown signs of slight catarrh, wakens flushed, frightened, and with a metallic cough and loud croupy breathing. The cry is not much affected, but the child is somewhat feverish (about 101° F. or so) and perspiring, and seems distressed. The fauces show only a slight catarrh.

After an hour or two the child becomes quieter and falls asleep. When he does so, or even when he merely becomes less anxious, the respiration is at once much easier—proving

the distinctly nervous character of the ailment. A second attack often follows on the same night, and the symptoms are also apt to recur about bedtime on the following evening. Thereafter they generally give place to those of an ordinary cold. A child who has had one attack of this kind is liable to have others. Occasionally the disease occurs at intervals for years. In many instances several children in a family develop the disease.

Diagnosis.—False croup is to be distinguished from diphtheritic laryngitis by its sudden commencement, its less severe character, and the more markedly spasmodic nature of the symptoms; also by the appearance of the fauces. In doubtful cases the history of previous attacks of a similar nature in the patient, or even in other children of the family, is very reassuring. It must be remembered, however, that in rare cases real croup may begin with symptoms very like those of false croup, and that it is comparatively common to have attacks of measles and whooping-cough commencing in a similar way.

Laryngismus stridulus should never be mistaken for this condition. The patients are younger, the spasms are shorter in duration, though recurring frequently through the day. Cough, fever, and coryza are absent, and there are almost always symptoms of rickets, often facial irritability, and sometimes tetany, present.

Treatment.—The main treatment of false croup consists in the application of warmth, internally and externally, to encourage the secretions and to soothe the child. Warm drinks are useful, and also the application of hot fomentations or poultices to the neck. It is also usually well to put the child into a warm bath, and, in severe cases, to erect a steam tent. A simple expectorant mixture may be given. Should there be the least reason to suspect the presence of undigested matters in the stomach or bowel, an emetic

(pulv. ipecac. grs. v) is indicated or a dose of castor oil. Neither of them should, however, be given as a mere matter of routine.

Laryngismus Stridulus (*Child-Crowing, Glottic Spasm*)

This is a purely nervous spasmodic affection of the respiration, causing, in its typical form, a sudden arrest of breathing for a few seconds, usually with the chest in the position of expiration, and followed by a crowing inspiration. While this is what usually happens, the arrest of breathing may occur with the chest in the position of inspiration, and then no crowing follows. The most striking phenomenon in an ordinary attack is the spasmodic closure of the glottis, but the other muscles of respiration also participate, more or less, in the spasm. The disease is an affection of the respiratory centres and not merely a local spasm of the glottis.

Symptoms.—The tendency to laryngismus generally begins gradually in children who are out of sorts in some way and almost always rickety. The attacks set in with great suddenness. The child, who has been sleeping quietly or playing about as usual, suddenly stops breathing, looks scared, and throws back his head with his mouth open. The body and limbs are rigid and the fists clenched. The face is at first cyanotic, and afterwards turns ashy pale. There may be a short loss of consciousness, and occasionally a general convulsion may set in. After a few seconds the spasm relaxes and there is a loud crowing inspiration somewhat like the whoop of whooping-cough. In many slight cases a few laboured inspirations accompanied by crowing are all that can be observed. In very severe cases the arrest of breathing may be so severe and may continue so long that the child dies in the attack. The number of the attacks as well as their severity varies greatly in different cases. They are generally more frequent during the night.

Rickets is almost invariably present in some degree. It is very common also to find other nervous manifestations, especially facial irritability (Chvostek's symptom), tetany, and general convulsions (see p. 319). Thus in one hundred consecutive cases of mine sixty-nine showed facial irritability, twelve had tetany, and no less than sixty had a history of general convulsions. Most of the latter were boys.

Causation.—In the great majority of instances laryngismus occurs in somewhat fat, flabby children who have moderate, but advancing, rickets. And the essential nature of its relation to rickets is proved by the rapid way in which it recovers under vigorous antirachitic treatment. Occasionally it is found as a symptom of chronic hydrocephalus.

The disease generally begins between the sixth and twenty-fourth month of life. It is commoner in boys than in girls, and is often seen in several children in a family. Gee and others have pointed out that it is most often met with in the first half of the year. In the hundred consecutive cases above referred to, eighty-one occurred between January and June inclusive, and only nineteen between July and December. This seasonal distribution has been attributed to the children's having been confined too much to the house during the preceding months. It is probable also that the prevalence of cold winds (east and north) during the spring months has something to do with it.

The immediate cause of the seizure is generally some slight nervous shock or emotional disturbance. A paroxysm often occurs on awaking from sleep, when the child is exposed to a draught of cold air, or when he is frightened or annoyed in any way—also during swallowing and straining.

Diagnosis.—This has been already referred to (p. 295). In a doubtful case the history of recent convulsions or the presence of facial irritability or of tetany is strongly in favour of the diagnosis of laryngismus.

Prognosis.—While the great majority of cases rapidly and completely recover under treatment, the prognosis must be guarded, as there is *always* a possibility of the next attack being prolonged and the child dying in it. When laryngismus sets in during an acute illness (*e.g.* pneumonia, measles, etc.), it is an ominous complication, and indicates a dangerous degree of weakness.

Treatment.—The first thing to be attended to in a case of laryngismus is generally the commencement of a vigorous antirachitic treatment—open air, suitable diet, cod liver oil, and phosphorus. Rapid and striking improvement very often follows the regular use of the *cold douche*. This should be given once or twice a day in front of a fire. The child should be taken from bed and placed in a bath with about one inch of hot water. A jug of cold water (60° to 65°) should then be poured over his shoulders, and he should at once be taken out of the water and rubbed with a towel till he is dry and warm. In some cases the douching frightens the child very much, but even when this is the case, it may be very successful in stopping the attacks. If the attacks are numerous or severe, it is well to give a *sedative* also. Bromide may be used, but antipyrine and chloral are generally more reliable in their action. If constipation or unhealthy motions are present, it is well to begin the treatment by a dose of calomel or grey powder and rhubarb. During the attacks of laryngismus the inhalation of ordinary *smelling-salts* is sometimes useful in arresting a spasm.

Laryngismus is, in my experience, one of the very few diseases which generally do better when the child remains an out-patient than when he is taken into a hospital ward. The explanation of this is not quite obvious. Probably, however, it may be attributed to the increased nervousness he feels when all alone in a hospital bed. He misses the reassuring support and comfort of his mother's arms, and the spasm is

therefore less easy to resist and more severe also when it sets in.

Congenital Stridor (*Infantile Respiratory Spasm*)

This comparatively harmless affection is characterised by crowing breathing, a peculiar formation of the vestibule of the larynx, and, in advanced cases, by some thoracic deformity. The characteristic stridor commences at birth, or, at latest, within a week or two after the child is born.

Symptoms.—The stridor consists in a croaking sound which accompanies inspiration and which rises to a high-pitched crow on quicker or deeper breathing. Expiration is usually noiseless, but sometimes, when the inspiratory noise is loud, it is accompanied by a short croak. When the crow is loud, there is considerable inspiratory indrawing of the sides of the chest. There is, however, little movement of the alæ nasi and no cyanosis. The child is evidently in no distress, and looks about him quite unconcerned. The loudness and pitch of the crowing noise vary from time to time, and even in severe cases there are occasional short periods of intermission during which no sound is heard.

In slight cases the noise ceases during sleep, but when the stridor is severe, it may last all the time. Any mental excitement increases it. It is not diminished by closing the nostrils or the mouth, but the introduction of an intubation tube stops it at once (Variot). The cry is loud and clear, and if a cough is present, it is quite normal in character.

During the early weeks of life the stridor increases in loudness with the child's growth in strength. Thereafter it generally remains about the same till some time after the sixth month, when it spontaneously diminishes; and it passes off before the end of the second year in most cases. Latterly it is only heard on occasions of special exertion or excitement.

In all cases which have lasted for any time there is a characteristic deformity of the upper aperture of the larynx (Fig. 84), which consists essentially in a very great exaggeration of the normal infantile peculiarities of the part (p. 262). The epiglottis is folded on itself, so that the aryteno-epiglottic folds lie very close together and render the transverse diameter of the upper aperture of the larynx extremely narrow. In uncomplicated cases there are no adenoid growths, and the fauces are normal. If the stridor is severe and lasts for any time, a distinct degree of pigeon-breast is produced.

As the child grows up, the vestibule of the larynx retains the characteristic deformity long after the stridor has ceased. It can often be recognised in children of nine or ten years, and probably much later. When the breathing becomes normal the thoracic deformity steadily lessens, and finally disappears.

Causation.—The etiology of this condition has been much discussed, and as yet it is far from being thoroughly understood. The stridor has been attributed to posticus paralysis (Robertson), and to adductor spasm (E. Smith, Löri) due to adenoid growths or other local irritation, to enlargement of the thymus (Avellis, Hochsinger), and to congenital malformation of the upper aperture of the larynx (Lees, Sutherland and Lack, Variot, Refslund). The present writer and Dr. Logan Turner have endeavoured to show[1] that, while the deformity of the larynx and the soft collapsable character of its structures are probably not without importance in the etiology of the stridor, the part which they play is only a secondary one; and that the essential and primary factor in

[1] Thomson and Turner, "On the Causation of the Congenital Stridor of Infants," *Brit. Med. Journ.*, Dec. 1, 1900; Thomson, *Edin. Med. Journ.*, Sept. 1892; *idem*, art. "Stridor des Nouveau-nés," *Grancher and Comby's Traité des Maladies de l'Enfance*, 2me ed. t. iii. p. 113; Turner, *Brit. Med. Journ.*, Nov. 24, 1906, ii.

FIG. 84.—Larynx of baby of 3 months who had suffered from stridor from birth, and died of exhaustion following diarrhœa.

FIG. 85.—Larynx of new-born child; showing normal conformation.

FIG. 86.—The same; showing effect of sudden suction through metal tube on the shape of its upper aperture.

the disease is not structural but functional. They hold that the principal cause of the obstruction is an ill-co-ordinated spasmodic action of the muscles of respiration, a choreiform respiratory spasm analogous to stammering—as distinguished from a laryngeal spasm. That such jerky forcible respiration would be likely to cause exactly this deformity is proved by a simple experiment. The larynx of a new-born child is removed along with the neighbouring parts (Fig. 85). A bent metal tube, 18 inches in length, is then introduced into the lower end of the trachea; and in order to keep the chink of the glottis open, a small piece of rubber tubing is at the same time placed between the vocal cords. When forcible inspirations are made through the tube, it is found that, with each, a striking alteration occurs in the upper aperture of the larynx, and that in many cases (as in Fig. 86) the resulting deformity is indistinguishable from that characteristic of congenital stridor. For further details and arguments in favour of this view of the etiology of the condition, and for an account of the literature of the subject, reference may be made to the above-mentioned paper.

Diagnosis.—The recognition of congenital stridor is easy in typical and uncomplicated cases. Taking into account the character of the stridor, the age at which it began, the normal sound of the cry, and the absence of distress and of any other sign of disease, one can readily exclude such conditions as laryngismus, laryngitis, and laryngeal papilloma.

The two diseases which may give rise to somewhat similar symptoms are enlargement of the bronchial and tracheal lymphatic glands, and adenoid growths, both of which conditions occasionally occur in very young babies.

The cases of noisy respiration due to *enlarged bronchial and tracheal glands* usually differ from those of congenital stridor in the following points: (1) The stridor is lower in pitch; (2) it is generally louder during expiration; (3) the

up and down movements of the larynx accompanying the noisy breathing are less extensive; (4) the voice and cry are generally affected; and (5) there is usually marked cachexia present from the cause of the enlarged glands.

The croaking present in cases of *adenoid growths* in very young babies sometimes resembles congenital stridor rather closely. In these cases also, however, it has a distinctly lower pitch, and there is usually a hoarse cry. The mouth breathing and other signs of nasal obstruction are likewise very noticeable. This form of croaking, unlike that of the real congenital stridor cases, is cured, or greatly relieved, by operation on the adenoids.

Prognosis.—Congenital stridor, when uncomplicated, is always recovered from. It must, however, be remembered that if children with this condition acquire any acute respiratory disease, the abnormal state of the larynx may act as a serious complication.

Treatment.—The only rational treatment of simple cases of this condition consists in careful regulation of the diet and of the general hygiene.

Laryngeal Papilloma

This is a rare affection, and does not generally produce symptoms till the child is two or three years old or more, although the disease is believed to originate at an earlier period. The main symptoms which characterise it resemble those of severe chronic laryngitis—stridorous breathing, a hoarse cry, and a croupy cough; and they gradually get worse in spite of treatment. In young children it may be practically impossible at first to make sure of the diagnosis.

Treatment.—In young children, surgical removal of the papilloma either by intra-laryngeal operation or by thyrotomy is often fatal from pneumonia or otherwise; and even if it

is successful at the time, it is very apt in them to be followed by recurrence of the growth. The best treatment consists in performing tracheotomy and allowing the child to wear a soft rubber tracheotomy tube for some years. At the end of this time the growths are sometimes found to have disappeared spontaneously. Should they persist, a thorough operation can then be carried out with less risk of complications and with a fair prospect of a permanent cure. According to Dr. Payson Clark,[1] no radical operation should be attempted until the child is at least ten years old.

[1] *Boston Med. and Surg. Journ.*, Oct. 1905.

CHAPTER XVI

ON THE NERVOUS SYSTEM

In most cases, marked nervous symptoms in young children are due to functional causes and not to organic nervous disease. It takes very little to upset a child's nervous system thoroughly, and when it is upset, localising symptoms of disease in the other systems are apt to become quite obscured. We have, indeed, to get into a habit of discounting the nervous manifestations present before we can estimate justly the meaning of the symptoms of acute disease in little children.

Structural disease of the nervous system, however, is by no means uncommon in early life. Occasionally it gives rise to marked and obvious symptoms, but often its clinical manifestations are curiously slight and equivocal.

Examination of Nervous Cases

When a child has to be examined as to the presence of disease of the nervous system, the necessary inquiries may be divided into three groups—

1. Investigation should be made as to the occurrence of *cerebral or nervous symptoms.* Thus we may ask about any change noticed in the child's disposition and temper, and whether he has been drowsy or delirious. We also inquire if the patient complains of pain in the head or elsewhere, or has photophobia (p. 29) or giddiness, whether at times he utters sudden screams, is often heard to sigh (p. 268) or

grind his teeth (p. 51), whether he vomits (p. 106) and is constipated (p. 108), and if he has had any convulsions.

2. The patient has to be examined for *physical signs.* We have already discussed the significance of the characteristic change in the physiognomy (p. 10), of distended cranial veins and a bulging fontanelle (p. 61), and of a slow and irregular pulse (p. 235).

The state of the pupils is also to be noted and the presence of any nystagmus or squint; and the ophthalmoscope is to be used (p. 29). A marked degree of cervical rigidity or opisthotonos is always of great importance.

The limbs are to be examined as to their sensibility and as to the presence of paralysis, rigidity, ataxia and tremor or other involuntary movements. The state of the superficial reflexes and of the knee jerks should be ascertained and the electrical reactions tested.

3. Previous occurrence of *illnesses which are known to be followed by nervous or mental disease* should be investigated. Thus, the former presence of severe middle-ear disease has great importance in suspected cerebral abscess, and if tuberculous meningitis is possibly present, the fact of the symptoms setting in some months after whooping-cough or measles is in favour of this diagnosis.

Some of the more important symptoms and signs of nervous disease may now be considered more fully.

Changes in Disposition and Temper

Great irritability and a marked change in character is often noticed during the prodromal stage of tuberculous meningitis. This is not often, however, of much help in diagnosis, as more or less similar mental disturbances are equally characteristic of various other abnormal conditions. Unwonted irritability is seen during the onset of most acute ailments (*e.g.* measles) and in a more chronic form in some

cases of dyspepsia and chronic diarrhœa and in chronic nephritis. It is an especially characteristic manifestation of lithæmia (p. 510).

Drowsiness

Drowsiness is an important symptom of intra-cranial disease. In many cases of tuberculous meningitis it is common during the onset and a prominent feature in the later stages. After epileptiform convulsions the patient is frequently drowsy for hours; and if the fits occur in a long series at short intervals, this drowsiness may become so marked and last so long, that even in cases where the brain does not ultimately suffer, it may look as if the child were becoming an idiot (Fig. 87).

Fig. 87.—Prolonged Stupor following repeated eclamptic attacks in a boy aged 6 months. The child entirely recovered.

Drowsiness is not, however, always a sign of brain mischief. We meet with it also in uræmia, in some gastric and hepatic cases, and in some feverish disorders such as pneumonia. It is also, of course, often the result of medicine (*e.g.* bromide), and when it sets in in the course of serious illness, it is especially important, before deciding its significance, to make sure that it is not merely due to excessive doses of alcohol.

Coma

Coma is commonly met with in childhood, and is almost always of the gravest significance. It occurs in diabetes,

in uræmia, in intra-cranial injuries and diseases of many kinds, including eclampsia, in various forms of poisoning, and in the last stages of many other diseases. Transitory attacks of coma have been described as occurring during the convalescence of measles (Goodhart and Still).

Delirium

Delirium is not uncommon in feverish conditions in childhood, and it may be recognised even in young babies by watching their gestures and expression. Its occurrence in any case depends less on the degree of fever than on the kind of nervous system the child has and on the character of his illness.

Some children become delirious if their temperature rises at night to 101° or even to 100° F., while others can stand a temperature of 106° F. without getting light-headed. Proneness to delirium at comparatively low temperatures is probably an indication of a very unstable nervous system.[1] In some cases of pyrexia where there is much debility the delirium may continue for a day or two after the temperature has become normal.

Although a recognised symptom in both tuberculous and non-tuberculous meningitis, delirium is much more frequently an indication of general toxæmia than of intra-cranial disease. It is common, *e.g.*, in peritonitis and in all sorts of septic infection, in enteric, in erysipelas, and in severe cases of infective disease of any kind. It is probably most common in pneumonia. The possibility of delirium being caused by atropine or belladonna is not to be forgotten.

Pain

When *persistent local pain* is complained of by young children, it almost invariably signifies the presence of organic

[1] Clouston, *The Neuroses of Development*, Edin. 1891, p. 12.

disease; and if the cause is not obvious, the child must be kept under observation. Pain of this kind must never be regarded as a trivial matter.

Pain due to disease in one or other *pleura* is sometimes referred by the child to the middle line in front, often to the epigastrium. Occasionally it is felt quite low down on the side of the abdomen, and when on the right side, may be mistaken for that of appendicitis. *Abdominal pain* is often, of course, due to digestive disturbance, but it is also frequently caused by spinal caries. Pain in the *thigh* or on the *inner side of the knee* is an early symptom of hip-joint disease, but in this situation or lower down (even in the foot) it may be due to spinal caries, and it sometimes occurs at a stage when no local abnormality of the spine can be discovered.

The shock which severe pain inflicts on the nervous system of a child is such that it should never be allowed to continue long without means being taken to allay it: prolonged and painful surgical dressings should usually be done under chloroform.

Headache

In children, as in adults, pain in the head is due to many causes.

In school children headaches are often complained of, and where they are recurrent they leave distinct traces on the *physiognomy*. Dr. Francis Warner says, "It is not uncommon to observe that a child looks as if he had a headache. Analysing such faces, you may soon observe a look of depression, heaviness, and fulness about the eyes, especially about the under eyelids: this sign is usually bilateral, and is due to a relaxed condition of the muscle (orbicularis) which surrounds the eyelids. If the patient can be made to laugh, the muscle becomes energised, and the expression of headache

is lost for the moment. This sign is often best seen in the profile view."[1]

In infants, headache may be the result of coryza or pyrexia, or of some gastric or hepatic disorder. If severe or persistent—especially if accompanied by vomiting—it is often a sign of meningitis or intra-cranial tumour. Severe headaches also occur in uræmia, malaria, anæmia, and plumbism.

One of the commonest causes of headache is the presence of *refractive anomalies*, especially slight degrees of hypermetropia and astigmatism; and when these are present, the use of suitable spectacles will generally prevent its recurrence.

The presence of *adenoid growths* also gives rise to headache in a large proportion of cases (50 per cent.—Crowley).

Dyspepsia is also a common source of headaches; and some, especially those which are confined to one temple, are due to *dental caries*. In many cases, whether there is a discoverable local cause or not, the patients are delicate children who are obviously being *overworked at school* and having too little fresh air and exercise.

Migraine, when it begins in young children (between two and five years), is often, according to Gowers, accompanied by a rise of temperature, so that the symptoms are like those of commencing fever. As the child grows older, however, the attacks assume the ordinary afebrile character seen in adults.

Recurrent headaches in children are sometimes greatly benefited by a combination of liquid extract of ergot (mx to xx), and solution of strychnine (mii to iii) (E. Smith).

Giddiness

Vertigo is sometimes found in young children. When in bed or sitting on his mother's knee, the child cries out

[1] *The Children. How to Study Them*, London, 1885, p. 51.

that he is falling, or that the roof or furniture is moving. This sensation of giddiness may be a symptom of *tuberculous* or of *posterior basic meningitis*. It also occurs sometimes during the onset of various infectious diseases, such as mumps, influenza, and measles. I have also known it recur, off and on, for months, in a most marked form in young children with obstinate constipation from *disordered digestion*, and nothing worse. When vertigo is present, the condition of the *ears* must, of course, always be investigated.

Screaming

A shrill, piercing scream—the "hydrocephalic cry"—is one of the classical symptoms of *tuberculous meningitis*. It is by no means, however, a constant phenomenon in this disease, and a cry of this sort, without other cerebral symptoms, is of no diagnostic importance. This kind of screaming is really more characteristic of *acute middle-ear disease*. Severe and repeated screaming is also met with in cases of chronic hydrocephalus when the fluid is increasing in amount, in severe cases of congenital idiocy, and in progressive dementia.

Screaming on slight occasion is a frequent symptom of various general and local diseases which give rise to great bodily distress and hypersensitiveness. As examples of this may be mentioned infantile scurvy, anal fissure, and severe irritation of the urinary tract (*e.g.* acute pyelitis).

Infantile Convulsions

It is hardly necessary to give a detailed account of a well-marked infantile convulsion, as its phenomena are just those of an ordinary epileptic seizure. It may be well, however, to say that there is the greatest difference in the severity of the attacks in different cases. In the worst, the tonic and clonic movements may be very severe, and the succeeding loss of consciousness profound and long-continued. In other

cases, there may be just the slightest momentary unconsciousness and no visible jerking at all. Slight and severe attacks often occur in the same child at different times.

Causation.—Like all nervous disorders which consist in disturbance of function, convulsions have often a multiple causation. That is to say, in order to explain their onset we must often take into account not only a combination of several exciting causes, but also a number of predisposing conditions. This point is of some practical importance, because we may sometimes succeed in stopping the recurrence of the convulsions by curing one or more of the causes, even although the others are quite beyond our treatment. The division into predisposing and exciting causes is convenient, although it must be admitted that it is not always easy to draw the line clearly between the two classes.

Of *predisposing causes* four may be mentioned: (1) There is, of course, the *age* of the patient—the state of development of the infant's nervous system predisposing him to all kinds of convulsive attacks. (2) Certain general diseases may predispose—especially *rickets*. This is by far the most important of the predisposing causes, as it is the only one which is amenable to immediate treatment. The tendency to convulsions in rickety children almost always disappears rapidly under antirachitic measures, even although obvious sources of peripheral irritation persist. (3) A very important predisposing element is an *inherited nervousness* of constitution. Some children are hereditarily so nervous that any rise of temperature or any peripheral irritation, however slight, may bring on a fit. This state of nervousness may be found in children who seem otherwise strong, and sometimes many members of a family have it to a marked extent. (4) Another predisposing condition is a permanently *damaged state of the brain* from any cause—quite apart from any recent changes in it. An area of cortical sclerosis, for

example, even when it does not seriously affect the mental functions, is very often accompanied by a tendency to convulsions. In the same way, nearly all the developmental and other lesions which produce imbecility predispose also to convulsions on slight provocation. The recurrence of convulsions in very young children should, therefore, always lead to a careful investigation of the child's mental state.

Possible *exciting causes* are very numerous indeed. The most important of them may be classed in one or other of three groups. (1) They may result from a number of *intracranial* causes (diseases, injuries, or circulatory changes). Such, for example, are concussion, hæmorrhage, tumour, abscess, and meningitis of all kinds; also the cerebral congestion which we sometimes get in whooping-cough and in some cases of congenital heart disease, and the cerebral anæmia which accompanies severe diarrhœa and loss of blood. (2) *General acute morbid conditions*, again, are often responsible for a convulsive attack. A sudden rise of temperature, such as would produce a rigor in an adult, will often in an infant cause a convulsion. This is seen in pneumonia and in various of the exanthemata, especially in scarlet fever. In uræmia fits are not uncommon, and a large number of poisons, both metallic and vegetable, often occasion them. (3) *Peripheral nervous irritation* is certainly a common exciting cause of fits, and one which is often present even when its site of origin is obscure. Undigested matters in the bowel or stomach, painful lesions in connection with dentition, otitis, or phimosis, may readily start a convulsion in rickety or neurotic infants.

Diagnosis.—There cannot usually be much difficulty in recognising a convulsion, if you see it. When, however, you have only the mother's description to go by, it may be impossible to be quite sure as to the nature of the "fit." Attacks of petit mal often pass unrecognised for months, from the idea that they are merely slight faints. On the other

hand, spasms of colic and laryngismus, and also rigors, are sometimes spoken of as fits. On two occasions, at least, I have seen cases of masturbation in female infants, who were being carefully nursed and were having bromides administered, under the impression that they were suffering from a serious variety of infantile convulsions.

Diagnosis of the Cause.—Whenever the urgency of the symptoms has abated, the first thing that demands our attention is the discovery of the cause of the attack. In endeavouring to settle this question, we have to take various matters into our consideration.

1. There is, to begin with, the patient's *age*. Should the attack come on within the first fortnight of life, the chance of its being due to a birth injury is to be remembered. It is, however, certain that convulsions from dyspepsia and from other causes, quite apart from trauma, often begin very soon after birth. To this subject we shall return later. Those convulsions which begin after the second week are not likely to have anything to do with a birth injury. They may arise from a defective brain, from dyspepsia, and from various other causes. The great majority of fits seen in normally developed babies between six months and two years belong to the rickety class.

2. The *character of the fit* often gives us but little help in the diagnosis, though occasionally it does shed some light on the question. If the features of the attack, *e.g.*, are those of petit mal, this generally, although not always, indicates a serious cerebral defect. If the fit is Jacksonian in character, this suggests a cortical lesion. If it is followed by prolonged unconsciousness, an organic cerebral cause becomes probable, although not certain. The fact of the movements being unilateral or asymmetrical does not necessarily, in young children, indicate a unilateral organic cause.

3. The presence of *symptoms of any bodily disease* that is

known sometimes to cause fits is, of course, of great importance. Thus, fever with rapid respiration, or a sore throat, may point to pneumonia or scarlet fever. A bulging fontanelle, head retraction, or paralysis, with a history of previous vomiting and headache, would suggest meningitis; while abdominal distension, malnutrition, etc., along with other dyspeptic symptoms, would naturally point to there being some connection with the alimentary canal.

Prognosis.—When mental defect is present after a series of convulsions, as is not seldom the case, it is generally probable that it existed before, and that it should be looked upon rather as a predisposing cause than as a result of the fits. Certainly, however, in some cases the intense cerebral congestion and excitement accompanying the seizure seriously injure the brain tissue, either by causing hæmorrhage or otherwise. The recurrence of convulsions is accordingly often followed by steadily increasing dementia, even in cases in which no naked-eye change is afterwards discoverable. Occasionally, although rarely, the attack may be fatal. This, however, probably occurs most frequently in cases in which the fits are complicated by laryngismus. These considerations emphasise the importance of using active measures to stop the attacks as soon as possible. In many cases, also, temporary damage is done, and one or other cerebral function may remain in abeyance for some weeks, or months, after a severe convulsive attack. Thus, passing hemiplegia, or aphasia, or amaurosis may occur, due to temporary exhaustion produced in certain areas by the nerve storm. Similarly, a condition of extreme intellectual dulness occasionally results, which is entirely and permanently recovered from after it has lasted for many weeks.

Treatment of the Attack.—If the convulsion lasts long enough to allow time for treatment, it is generally advisable to begin by putting the child into a mustard pack or hot bath.

It will be good for him, probably, and it will certainly soothe and relieve his alarmed relatives, who need something to do to take up their attention. To prepare the mustard pack, a towel is dipped into a quart of tepid water with which a tablespoonful of mustard has been thoroughly mixed. It is then swathed round the infant's body, covered with the blankets, and left in position for from ten to fifteen minutes.

If the convulsive movements continue for more than a few minutes, or if they go on recurring at short intervals, more active measures are called for, and some form of sedative should be given. Chloroform is one of the best to use, and its administration is quite safe and often successful. Chloral hydrate is also very effectual, and its influence lasts longer than that of chloroform. If the child cannot swallow, it may be given hypodermically (grs. ii to iii), or introduced into the bowel through a rubber catheter. For rectal injection, grs. v may be given to a baby of six months, and grs. x to one of a year old. In severe cases, perhaps the most effectual treatment of all is the hypodermic injection of morphine. Of this, gr. $\frac{1}{24}$ may be given to a well-grown baby of a year, and the dose may be repeated in half an hour if no effect is produced. Morphine should not, however, be given to weakly or undergrown babies.

The chief question with regard to treatment in most cases of convulsions, however, is not so much how to deal with the attack, as how to prevent its recurrence. The answer depends largely on the type of case with which we have to do. We shall, I think, best deal with this, and also with other questions regarding prognosis, if we consider briefly a few of the commoner types of infantile convulsions.

Some Common Types of Convulsion Cases

1. **From Birth Injury.**—If convulsions set in in a newborn baby within the first week or so of life, it is only

natural to suspect that they may be due to intra-cranial hæmorrhage from birth injury. This suspicion is greatly strengthened if the labour has been a difficult one (protracted, breech-presentation, or forceps), and if there was difficulty in getting the child to breathe after birth. If the fontanelle is tense and bulging, this is a very strong point in favour of a diagnosis of hæmorrhage.

The *treatment* should generally be purely expectant. The infant is to be kept quiet and warm, and everything possible done to favour his nutrition. Sedatives are not usually called for. Cushing has recommended [1] opening the cranium in these cases. While this suggestion has much to recommend it to our consideration, its advisability in most cases cannot be said, as yet, to have been established.

The *prognosis* must always be very guarded. It is probable that many of the children who have traumatic cerebral hæmorrhages at birth recover completely. It is, however, certain that a considerable number of those who seem to get quite well show symptoms of paralysis, or mental defect, in later childhood.

2. **From Dyspepsia.**—In many infants who have convulsions, the attacks are clearly due to dyspepsia. Whether they arise reflexly from local irritation in the bowel, or are caused by some sort of auto-intoxication, need not be discussed here. In these cases the fits may begin very soon after birth, or indeed at any time during infancy.

The main *treatment* consists in attention to the digestion, and especially in thorough regulation of the diet. The administration of modified and peptonised milk is often successful along with the judicious use of calomel, antacids, and stomach-washing. Far the best treatment, however, consists in the employment, when possible, of a wet-nurse.

[1] *Amer. Journ. of Med. Sci.* cxxx., 1905, p. 563.

Generally, no sedatives are required; but sometimes a few doses of chloral may be useful at first.

The *prognosis* depends on the progress of the dyspepsia. There is no likelihood that the brain will be seriously or permanently damaged.

3. **Idiopathic Convulsions.**—The next group of cases may conveniently be called "idiopathic convulsions," because no organic or peripheral cause can be discovered to account for them. It may well be that these cases are really, after all, due to reflex irritation, or auto-intoxication, which remain unrecognised. The practical point to remember, however, is that such causes are not discoverable, and therefore cannot be treated, and that a purely symptomatic treatment of the convulsive tendency is often entirely successful.

The fits in these cases may begin as early as the first week, and generally appear within the first few months of life. The convulsions are not generally very severe or prolonged, and there may be only two or three of them in the day, at first. They usually, however, increase in number, and there are often as many as twenty, or even forty, in the day; and this may continue for weeks. It is, therefore, most important that the *treatment* should be prompt and thorough.

To temporise with moderate doses of bromide, or to try alterations of diet when none are distinctly called for, is merely to lose time. What is necessary is to get the infant, as soon as possible, thoroughly under the influence of chloral; and in these cases this can be easily given by the mouth. In the youngest babies, gr. i every two hours, and in children of one or two months, grs. i to ii, is not too large a dose. The chloral should be continued, in these doses, until the fits have ceased for at least twenty-four or thirty-six hours, and then only gradually diminished in frequency. If the first dose given is not enough, the amount must be cautiously

increased, until the baby is *almost* too drowsy to swallow. The greatest care must, however, be given to the feeding in these circumstances, as otherwise there is a considerable risk of an inhalation-pneumonia being set up. Usually we find that, after the chloral has been used for three or four days at most, the fits cease to return when it is stopped, and the child gets quite well. Occasionally there is a slight recurrence of the symptoms, but not often.

The *prognosis* is, therefore, generally favourable. It must, however, be guarded, because the babies are so feeble that intercurrent disease is to be feared, and also because it is hard to be quite sure that no organic lesion is being overlooked. I have recently seen two cases in which convulsions, apparently of this type, ushered in a very early acute general tuberculosis. There seems to be no tendency for fits of this kind, even if very numerous, to cause permanent damage to the intellect. Sometimes, however, the baby remains quite drowsy and stupid for weeks after they have ceased (p. 307).

4. **From Rickets.**—The commonest kind of convulsions met with in a city practice in this country are those which occur in rickety children about the age of teething. In these, the predisposing cause is all-important; for if the rickets is energetically treated, the morbid sensitiveness to peripheral irritation rapidly ceases, and there are no more fits, even although no sedative drugs are given.

The age for this variety of convulsions is between six months and two years; and they are commoner during the spring months, when cold winds are blowing, than at any other time of year. The rickets is generally in an early and progressive stage. The diagnosis is made by noting the presence of rickets and the absence of signs of fever, or cerebral defect or disease. It is strongly confirmed if facial irritability (Chvostek's symptom), laryngismus, or tetany is, or has recently been, present.

Prompt *treatment* of the rickets leads, almost invariably, to most satisfactory results. The digestion has, of course, to be seen to, and the diet regulated on strictly antirachitic lines. Cod liver oil, with or without phosphorus, should be given. It is of great importance to see that the child has plenty of fresh air. It is well also to institute a regular cold douche once or twice a day; this has a powerfully soothing effect. Under such a regimen the baby's health usually improves rapidly, and the convulsions cease almost at once. Should they be very numerous, however, or very severe, it may be well, during the first day or two, to give a few doses of antipyrine (grs. i to ii) or chloral (grs. ii to iii).

5. **From Congenital Cerebral Defect.**—In many cases the occurrence of convulsions in an infant is the first, and it may be, as yet, the only sign of idiocy. Generally, the seizures, in these circumstances, take the form of petit mal to begin with. The baby is seen from time to time to give a sudden jerk forwards of his head and shoulders. After this, he may be unconscious for a minute or so, with heavy breathing, and he often cries bitterly. As he gets older his "turns" become more obviously epileptiform in character, and usually develop into ordinary convulsions.

The occurrence of such attacks is a very bad omen for the child's future. They tell of a serious defect of the brain, and their frequent recurrence is always followed by further mental deterioration. The character of the fits, and the usual signs of mental backwardness, soon render the diagnosis easy.

The results of *treatment* are apt to be most disappointing. Sedatives have only a slight and temporary effect. If they are pushed, they upset the digestion and do more harm than good. Frequent changes to the country, and at times the administration of iron or some other tonic, form generally the best treatment. In a few cases, the administration of thyroid does good for a time.

6. **From Congenital Syphilis.**—There is another variety of fits, indicating severe structural disease of the brain, which is sometimes met with in syphilitic babies of a few months old.[1] In these cases the convulsive movements, which are often very slight, are generally one-sided to begin with, or there may be only a series of twitchings of one arm or leg. They may be accompanied by a momentary loss of consciousness or only by a dazed look. Later, twitchings appear on the other side of the body, and the limbs first affected become flexed and contractured. The child's intelligence steadily deteriorates.

The cortical lesion which gives rise to these symptoms consists in a patchy softening of the grey matter with degeneration of the arteries, and it ends in sclerosis. The resulting dementia is severe in degree and permanent (p. 439). Treatment seems to have no effect.

State of the Pupils

The size of the child's pupil and also the range of its reaction to light are relatively small during the early weeks of life, but they increase steadily after the first month.[2]

Contracted pupils are seen normally in sleep, and they are met with during waking in the early stage of meningitis and in opium narcosis.

Widely dilated pupils, responding little or not at all to the action of light, are seen in the later stages of most serious cerebral diseases and also in "hydrocephaloid." Marked inequality of the pupils is seen in serious cerebral disease and also in cases of affection of the sympathetic in the neck.

[1] Ashby, "On Convulsions during Infancy and Childhood," *Lancet*, Jan. 21, 1905, p. 136.

[2] H. Pfister, "Ueber das Verhalten der Pupille und einiger Reflexe am Auge im Säuglings- und frühen Kindesalter," *Archiv für Kinderheilk.* Bd. xxvi. p. 11.

Rhythmical contraction and dilatation of the pupils (hippus) is observed occasionally under a variety of circumstances. It is especially frequent in cases of spasmus nutans.

Strabismus

Any deviation in a child's eyes is usually spoken of as squinting. This is met with as the result of three distinct conditions:

1. *Simple disturbance of co-ordination* of the ocular movements. This is not real strabismus. It is often normally present, and may occur in a severe degree in any case of high fever in young babies, quite apart from any head mischief, as well as in cases of meningitis and other intra-cranial disease.

2. *Ordinary concomitant strabismus* occurs very commonly in children as a result of some refractive anomaly—especially hypermetropia. It may appear for the first time after a convulsion or during an attack of spasmus nutans, and it is sometimes due to cerebral injury at birth.

3. *Paralytic strabismus* is most frequently seen as a symptom of tuberculous meningitis. Sometimes it is due to a cerebral tumour (Fig. 88). Occasionally also it is caused by diphtheritic paralysis, in which case it is generally slight in degree and reveals itself mainly by the diplopia which it occasions.

Nystagmus

We may divide oscillating movements of the eyeballs into "nystagmoid movements" and "nystagmus proper." The former term may be used to describe such aimless shaking of the eyes as is seen in some idiots, and the rhythmical twitching which occurs when a patient with conjugate deviation tries to look straight forward and his eyes automatically jerk back to their former position.

Nystagmus proper in childhood includes two conditions —"ordinary nystagmus" and "the nystagmus of spasmus

nutans." These two differ widely from one another in causation, significance, and prognosis.

Ordinary nystagmus either dates from the earliest infancy or is acquired later. In the former case it is due to some local condition which has interfered with the infant's sight at the time when he should have been learning, by the aid of vision, to keep his eyes steady. It is met with in cases of corneal opacity from ophthalmia neonatorum, in congenital, or very early, cataract, in early irido-choroiditis, in coloboma, and in albinism, also in some cases of severe refractive anomalies. Not very rarely no cause can be discovered. The acquired variety has generally some central cause. It occurs, *e.g.*, in some cases of meningitis and hydrocephalus, in some of porencephaly and congenital spastic diplegia, in Friedreich's ataxia and disseminated sclerosis, and occasionally in intra-cranial tumours. In some cases of ordinary nystagmus, however, no local or general cause can be found.

FIG. 88.—Tumour of Medulla, involving nuclei of 6th and 7th nerves. Girl aged 2 years.[1]

The peculiar **nystagmus of spasmus nutans** differs from the ordinary kind not only in its being usually (though not always) associated with head movements, but also in the following particulars :[2]—

[1] *Trans. Med. Chir. Soc. Edin.* x., 1891, p. 210.
[2] *Brit. Med. Journ.*, March 30, 1901.

(*a*) *Its Time of Onset.*—It is always acquired—setting in, almost invariably, between the ages of six months and two years, while the baby is learning to control his ocular movements. It seems never to have been observed except in early childhood.

(*b*) *Its Tendency to Recovery.*—It is always recovered from within a certain number of weeks or months. Ordinary nystagmus is generally permanent.

(*c*) *The Character of the Movements.* — Ordinary nystagmus is nearly always bilateral and horizontal. This form is often unilateral, often vertical or rotatory, and not very rarely shows different directions of movement in the two eyes—*e.g.* horizontal or vertical in one, and rotatory in the other.

Ordinary horizontal nystagmus is *always* conjugate—the antero-posterior axes of the two eyes remaining parallel to one another all the time. The nystagmus of spasmus nutans, when bilateral and horizontal, is usually convergent —that is to say, the corneæ incline alternately towards and away from one another. Rarely it is distinctly conjugate. Very often indeed the movements are so small in extent that it is almost or quite impossible to decide the exact relation of the movements of the two eyes to one another.

In those cases of spasmus nutans in which the nystagmus is rotatory, there is likewise a peculiarity in the extent and character of the movements. In the ordinary rotatory nystagmus seen under other circumstances, the movement consists of a simple rotation of the globe round its antero-posterior axis, the central point of the cornea remaining practically unaltered in position. In the rotatory nystagmus of head-shaking, however, the eye movements are more of the nature of circumduction than pure rotation. In them the central point of the cornea passes through an ellipse or some other more or less irregular rounded figure.

It is very desirable that this unimportant variety should be clearly differentiated from the more or less serious ordinary kind of nystagmus, because of the entirely different significance of the two phenomena and their different prognosis.

The Fundus Oculi

The fundus should always be examined for choroidal changes in cases of possible syphilis, especially in older children. When persistent headache or vomiting or any other symptom of intra-cranial mischief is present, optic neuritis is to be looked for. Occasionally the discovery of tubercles, or of patches of atrophy evidently of syphilitic origin, in the choroid may throw a great deal of light on an obscure case.

Optic neuritis is present in most cases of intra-cranial tumour, although it is sometimes absent during the whole course of that disease. It often sets in early, and may escape notice for long because it causes at first so little interference with vision. It may be met with under a considerable variety of conditions besides cerebral tumour—*e.g.* meningitis, cerebral abscess, cerebral thrombosis, myelitis, otitis media, acute general tuberculosis, malignant endocarditis, etc. In tuberculous meningitis it very often occurs. It sets in late in the case and is usually not severe in degree. In posterior basic meningitis it is very rare.

Tubercles are not often found in tuberculous meningitis. They are, however, common in acute general tuberculosis.

Cervical Opisthotonos

Head retraction with rigidity of the neck, or cervical opisthotonos, generally indicates the presence of meningitis. It is sometimes seen in a slight and passing form in tuberculous meningitis, but is much more characteristic of posterior basic and epidemic cerebro-spinal meningitis. In

these cases, it is almost invariably present, it is an early symptom and is often very marked, and it continues so for weeks (pp. 405, 411). It may also be met with in chronic hydrocephalus (Fig. 89) and in cases of cerebellar tumour.

Although usually, when severe, a symptom of intra-cranial disease, head retraction is sometimes met with apart from any cerebral or meningeal lesion. It is often seen in a marked form in acute otitis. It has been described in enteric fever, diphtheria, and pneumonia, in cases where the brain was found to be normal; and it is also met with not very rarely in wasted babies with dyspeptic disturbances. A minor degree of head retraction occurs rarely in tetany. Various surgical affections, such as retro-pharyngeal abscess and cervical caries, cause a stiffness of the neck and drawing back of the head which may be mistaken for cervical opisthotonos of intra-cranial origin.

Fig. 89.—Chronic Hydrocephalus following Meningitis, showing head retraction, in a girl aged 1 year.

The Superficial Reflexes

In early childhood the skin reflexes differ considerably from those in later life. During the first year especially, some of them—*e.g.* the abdominal reflexes—are often absent altogether. They are generally poorly marked and never exaggerated in young children. Sometimes, however, as

R. Laurent has pointed out,[1] during the first nine months the area, stimulation of which elicits the reflex, is considerably enlarged. This is never found after the fourteenth month. The cremasteric reflex is often absent in young children.

The Plantar Reflex

As Babinski stated in his first paper on this subject, an extensor response is normally present in new-born children. This is not, however, the only peculiarity of the plantar reflex in infancy. The effect of stimulating the sole in a young baby has been described as follows by Dr. James Collier:[2] "The earliest response is in the great toe, which is drawn back. This is followed by extension and spreading out of all the toes with eversion of the foot and dorsiflexion of the ankle, and subsequently flexion of the hip and knee. Strong stimulation causes a general irregular movement of the limbs and trunk." This "infantile response" "contrasts most markedly with the adult form, with the contracted flexed toes, inverted foot, and the early hip response."

As the child grows older, the preponderance of dorsal over plantar flexion steadily diminishes, until by the end of the first year the proportion of each is about 50 per cent. of the whole.[3] During the second year dorsal flexion becomes increasingly common. About this age, however, the reflex is often not easily obtainable. By the third year, a flexor response is practically always present in healthy children.

Although the transition from dorsal to plantar flexion normally occurs about the time when the child is learning to walk, it does not seem to be due to this; for plantar flexion is found in many children who cannot walk, and is absent in some who do. In weakly, backward children, the appear-

[1] "Evolution des Réflexes chez l'Enfant," *Thèse de Toulouse*, 1905.
[2] *Brain*, Spring 1899, p. 78.
[3] Engstler, *Wien. klin. Wochenschr.*, June 1, 1905, p. 567

ance of the normal flexor response is apt to be delayed, while in strong, vigorous infants it appears sooner than usual.[1]

During sleep the plantar reflex is less marked, but generally its type is the same as occurs in the same individual when awake. Occasionally, however, children are met with, even as old as twelve, who present a typical infantile response during deep sleep, although during waking they show the ordinary plantar flexion (Collier). The same thing may sometimes be noticed during chloroform narcosis and immediately after an epileptic seizure.

In older children the significance of changes in the plantar reflex is the same as in adults. In infants under two, Babinski's symptom has generally no value as a sign of disease. If, however, in premature and ill-developed infants who are late of walking a flexor response is obtained, it is a good omen.[2] It indicates that cerebral spastic diplegia is not in process of development, and therefore justifies the prediction that the children will ultimately be able to walk.

The Lip Reflex of New-Born Children[3]

When we consider that the act of sucking is the most fully developed voluntary co-ordinated act of which the newly born child is capable, it is not surprising that the lips should be the seat of a special reflex at birth. It is probable that the lip reflex serves a useful purpose in assisting the infant's first unpractised attempts at sucking. By its means the mouth assumes automatically a more convenient shape for receiving and retaining the nipple. In the same way the

[1] Passini, *Wiener klin. Wochenschr.*, 1900, No. 41.

[2] Léri, *Revue neurolog.*, July 30, 1903, p. 689.

[3] See Escherich, *Traité des Maladies de l'Enfance* (*Grancher et Comby*), t. iv. p. 755, Paris, 1898 ; Loos, *Verhandl. d. Gesellsch. f. Kinderheilk.* (Frankfurt-a'-M., 1896), Wiesbaden, 1897 ; Thomson, *Rev. of Neurol. and Psychiatry*, March 1903 ; Toulouse and Vulpas, *Comptes rendus hebdominaires des séances de la Société de biologie*, Séance du 11 Juillet, 1903.

THE LIP REFLEX.

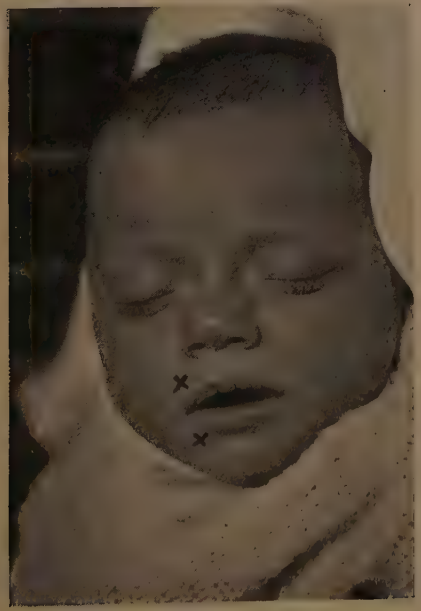


FIG. 90.—Before tapping.

FIG. 91.—After first tap.

FIG. 92.—After several taps.

mother's nipple, when subjected to mechanical stimulation, contracts so as to become thinner, longer, and harder, and therefore more easily grasped and retained by the infant's mouth.

The reflex is best elicited by a series of gentle taps on the upper lip a little above the angle of the mouth, or on the under lip a little below it (Fig. 90). It can, however, be got anywhere on the lips in a well-marked case, and sometimes over a considerable part of the cheek. A gentle touch on the mucous membrane of the lips, such as might be given by the mother's nipple, will often originate some degree of the movements.

On tapping the upper lip, there is often, first of all, a slight momentary jerk. This is generally towards the side tapped, but sometimes towards the other side. Almost at the same time the lips close, if they have been parted, and become deliberately pursed together so as to pout a little. As the tapping is repeated, the protrusion of the mouth becomes more and more marked (Fig. 92). In some instances the projection is straight forward, but generally the central point of the mouth turns markedly towards the side *opposite* to that tapped. Both upper and lower lips participate in the pouting. In some cases the preliminary jerk is not seen. In some, after repeated tapping, there are to-and-fro sucking movements of the tongue along with the pouting. When the lower lip is tapped, the resulting phenomenon is much the same.

The lip reflex seems to occur more or less distinctly in all healthy new-born babies when they are sound asleep, and in a considerable proportion of them when they are sleeping lightly, or even are only drowsy. I have seen it in a few new-born infants who were evidently quite wide awake; but this is rare.

As the children grow older the reflex is less frequently found, and is only present when they are sound asleep.

Until the end of the third or fourth year it is fairly common. After that it is less so, and it is usually also less marked in character. I have found it in older children up to twelve years, but have not examined for it in adolescents or adults. It is important that the lip reflex should not be confused with "facial irritability" (Chvostek's phenomenon) (see below).

Infants of a few months who are taking large doses of chloral on account of repeated convulsions, often show the lip reflex in a peculiarly marked degree. Probably this may be due partly to their being able to stand an unusual amount of percussion without being roused by it from their deep sleep. I have, however, seen it very strongly present in several babies who were taking convulsions and who had not had any sedative drugs.

Some cases of spastic diplegia show energetic chewing, sucking, and swallowing movements when touched on the lips and other neighbouring parts. This phenomenon seems to represent a great exaggeration in degree and extent of the normal lip reflex.[1]

Mechanical Irritability of Motor Nerves (*Chvostek's Sign*)

This is a much commoner and more important symptom in childhood than in adult life. It is most frequently seen and most easily studied as it affects the facial nerve—"facial irritability." Often, however, cases are met with in which tapping over the motor points all over the body elicits brisk contraction of the corresponding muscles.

Facial Irritability.—This consists in a sudden contraction of the muscles supplied by the facial nerve when a sharp tap is given to the cheek below the malar eminence. The contraction resembles that caused by the momentary passage of a galvanic current (Figs. 93 and 94). It is

[1] H. Oppenheim, *Monatsschr. f. Psychiat. u. Neurol.* Bd. 14, H. 4, S. 241.

sometimes more marked on one side of the face than on the other, and in some cases it is more noticeable in the upper, in others in the lower half of the face. Sometimes only the lips are moved. A similar contraction of the inner end of the eyebrow may often be caused by tapping on the temple.

Chvostek's sign differs essentially from the lip reflex in the following respects: It is observed equally during sleeping and waking, in children of any age, and it is not a reflex. The movements elicited are confined to the side

FIG. 93.—Before tapping.

FIG. 94.—On tapping.

FACIAL IRRITABILITY.

tapped, they are momentary and not at all co-ordinated or purposive. They are probably always, in some degree, pathological in significance.

The lip reflex, on the other hand, occurs almost exclusively during sleep, is most marked in very young babies, and has the characters of a true reflex. Its movements involve both sides of the mouth, and they are deliberate, co-ordinated, and quasi-purposive. In its ordinary form the lip reflex is a normal phenomenon.

Facial irritability is not uncommon in older children, and

it occurs in them not only with tetany and certain other nervous conditions, but with slight dyspeptic disorders, and sometimes apart from any ascertainable disease. In young children it is common, but it is rarely, if ever, found before the sixth month. It occurs in most cases of tetany and laryngismus. When met with alone, in children under three years old who have any sign of rickets, it may, practically always, be regarded as a danger-signal showing a state of abnormal nervous excitability and a probable tendency to more serious neuroses (p. 481). Under these circumstances, therefore, it must be taken as an indication for prompt sedative, tonic, and especially anti-rachitic treatment.

Myotatic Irritability

A marked decree of myotatic irritability is often met with in children, and is frequently found in cases in which there is no tubercular disease.

State of the Knee Jerks

To obtain the knee jerks in a young child, while he is sitting on his mother's knee, it is best to place the palm of the left hand under his foot, and to support his leg in this way as by a stirrup; then, on tapping gently with the middle finger of the right hand or, better, with a percussion hammer, the amount of movement which takes place is readily felt as well as seen. In strong, healthy children the knee jerk is generally easily obtained. In those with weak and flabby muscles it may be difficult to make sure of its presence. When there is difficulty in eliciting the knee jerk in the ordinary way, it may sometimes be got by gentle tapping with the limb considerably extended.

In childhood the knee jerks are generally brisk. In healthy infants under six months this is especially the case. It may, however, sometimes be difficult to elicit them at this age,

owing to the child's restlessness. Considerable increase of the knee jerks may be present in nervous children apart from any organic disease.

They are nearly always absent in diphtheritic paralysis, in peripheral neuritis, in progressive muscular atrophy and pseudo-hypertrophic paralysis, in those cases of infantile spinal paralysis in which the extensors of the thigh are affected, and in various other conditions. The knee jerks are absent in a large proportion of cases of croupous pneumonia in children (Pfaundler,[1] 27·5 per cent.; Kephallinós,[2] 41·5 per cent.). This may be of value in diagnosis, as loss of the knee jerks is not found in other acute feverish conditions except neuritis and poliomyelitis.

The knee jerks are increased in most cases of infantile cerebral paralysis, though, in some, the extremely spastic condition of all the muscles renders the movements even less than normal; also in myelitis and pressure on the cord above the lumbar region, and in certain other forms of organic disease of the brain and spinal cord. They are also exaggerated to a less extent in children who have suffered from a prolonged feverish illness such as enteric fever. They may be increased to a considerable degree in cases of severe and long-standing hysteria.

Kernig's Sign

This consists in a reflex contraction of the hamstring muscles which occurs whenever an attempt is made to extend the knee joint while the thigh is kept at right angles to the trunk. It can be elicited either when the patient is sitting on the edge of the bed or when he is lying on his back.

When other symptoms of meningitis are present, the

[1] *Münch. med. Wochensch.*, No. 29, 1902.
[2] *Ibid.*, July 24, 1906, p. 1460.

discovery of Kernig's sign affords fairly strong confirmation of the presence of that disease. The value of the sign in clinical work is, however, disappointingly small. It is generally a marked feature in cases of cerebro-spinal meningitis, but in some typical cases it is absent throughout. It is not rare in tuberculous meningitis, although less common in it than in the non-tuberculous variety. It is occasionally present in a variety of conditions in which the meninges are not inflamed. It may, for example, be found in intra-cranial hæmorrhage and abscess, and also in cases of pneumonia, uræmia, typhoid fever, and in other intestinal diseases when nervous symptoms are present which resemble those of meningitis (meningism).

In young infants, owing to the tendency to hypertonicity of their muscles, Kernig's sign often cannot be satisfactorily demonstrated.

Tache Cérébrale

This symptom—the unusual persistence of marked hyperæmia in the track of a light scratch on the skin—used to be thought pathognomonic of meningitis. It is common in the later stages of severe cerebral cases, but is of little or no diagnostic value. It may occur in enteric and other fevers without any brain lesion being present.

Paralysis

In investigating any apparent loss of muscular power in a child, we have, *firstly*, to decide whether it is a true paralysis, or merely a pseudo-paralysis resulting from the pain which movement causes, from extreme flabbiness of the muscular tissue, or from some malformation; and *secondly*, if a true paralysis, whether it is due to a lesion of the brain, cord, or peripheral structures, or is a so-called functional palsy such as may be met with in hysteria or as the result of peripheral irritation.

Pseudo-Paralysis

Disinclination to move the limbs, owing to the pain which movement causes, is seen in cases of *disease* or *injury* of the muscles, ligaments, and bones. If present in the upper arm soon after birth, it may be due to injury of the upper epiphysis of the humerus during delivery. In syphilitic infants between four and twelve weeks old it is generally caused by *specific epiphysitis*, and most frequently affects the upper limbs (p. 514). A somewhat similar pseudo-paralysis occurs in cases of *infantile scurvy*. This, however, is most frequently met with in children between eight and fourteen months old, and affects the lower more often than the upper extremities. It must be remembered that true paralysis (*e.g.* from anterior poliomyelitis or peripheral neuritis) is occasionally accompanied at first by severe pain on movement.

The pseudo-paralysis seen in *rickets* seems to be due more to muscular debility and laxity of the ligaments than to tenderness of the structures, although that may have some share in producing it. While it may be noticed during any stage of rickets, it rarely causes any difficulty of diagnosis except somewhat late in the course of the disease, when the characteristically rickety symptoms have more or less subsided. It is always symmetrical, and is generally noticed in the lower limbs, although the upper limbs. if examined, will be found similarly affected.

The weakness caused by *congenital dislocation of the hip joint*, and by various other congenital malformations of the limbs, is apt to be attributed to infantile paralysis.

Diagnosis of Paralysis.—In endeavouring to ascertain the cause of a local or general paralysis in a child, we have to inquire as to the nature of its onset and the symptoms which preceded and accompanied it, and to examine the

parts affected as to tenderness to touch and on movement, sensibility of various kinds, active and passive mobility, the state of the reflexes and the electrical reactions. We have also to remember which diseases are likely to occur at the age of the patient.

Paralysis which is present at birth may be the result of intra-uterine disease or arrest of development. Generally, however, it is caused by some injury sustained during the progress of the labour. Cases arising in this way have sometimes been spoken of as "obstetrical paralyses," but it is better to call them *birth palsies* (Gowers[1]).

Tremor

Tremor is a rare symptom in young children. A general coarse tremor is sometimes met with in certain forms of infectious disease such as enteric fever and influenza, and in tuberculous meningitis, and it is characteristic of multiple sclerosis. Local tremor of a limb is seen in some cases of cerebral tumour.

Ataxia

Defective co-ordination is such a characteristic feature in the movements of healthy infancy that slighter degrees of morbid ataxia are apt at first to be overlooked. A transient and slight form of ataxia is sometimes seen in children with normal nervous systems who have been confined to bed for some weeks with any acute feverish disease such as scarlet fever, and also in those who have been kept lying constantly for months owing to spinal caries. Generally, however, ataxia is a symptom of more or less grave significance. It is characteristic of such conditions as tumours of the cerebellum and mid-brain, of Friedreich's disease, of chorea, of some cases of diphtheritic paralysis, and of certain rare cases of hysteria.

[1] "On Birth Palsies," *Lancet*, vol. i., 1888, p. 709.

Dr. F. E. Batten has recently[1] drawn attention to three varieties of cerebellar diplegia in children of which the main symptom is ataxia. These are: (*a*) *Congenital Cerebellar Ataxia—i.e.* congenital ataxia in mentally normal children often with practically no other indication of intracranial disease: this has a tendency to steady improvement and sometimes almost complete recovery in the course of development. (*b*) *Acute Ataxia* (encephalitis cerebelli). These cases develop suddenly in healthy children with acute symptoms. They tend to improve and frequently recover. (*c*) *Progressive Cerebellar Ataxia.* This develops slowly in previously healthy children, and has a tendency to progressive increase.

Myatonia

A general powerlessness of the voluntary muscles from lack of tone is not a very uncommon condition in feeble infants. A degree of it is present, along with abnormal relaxation of the ligaments, in many cases of rickets, and it is especially often a marked feature in mongolism.

In 1900, Oppenheim[2] described a distinct disease which he called "myatonia congenita," and his observations have since been confirmed by a number of other writers. This condition is characterised by a general or localised hypotonus, from birth, of the voluntary muscles. The weakness is sometimes so great that it almost amounts to paralysis, and there is diminution or loss of the tendon jerks, with lowered electrical excitability.

The prognosis is not altogether unfavourable, as some of the cases described have improved considerably while under

[1] "Ataxia in Childhood," *Brain*, Autumn and Winter No., 1905, cxi. and cxii. p. 484.

[2] *Monatsschrift f. Psychiatrie und Neurologie*, Bd. viii. H. 3, 1900; also *Berlin. klin. Wochenschr.*, 1904, No. 10. See also W. Kundt, "Ueber Myatonia Congenita," *Inaug. Diss.*, Leipzig, 1905.

observation. Electrical treatment with massage is to be recommended.

Sensory Defects

Defects of ordinary sensibility are less frequently met with in children than in adults, and, unless marked in degree, are difficult to estimate. General tenderness to touch and movement usually arises from the presence of some such constitutional disease as rickets or scurvy, or of some local affection of the part, and less frequently from lesions of the nervous system. Pain on movement is also a very important fact, and great care must be taken to ascertain the exact nature of the movements which cause pain.

Electrical Reactions

When it is important to ascertain the electrical reactions in a young child, it is generally best to administer chloroform, as otherwise the child's struggles will make a proper examination exceedingly difficult and often impossible.

Lumbar Puncture

This is a simple proceeding; it does not usually, in young children, require an anæsthetic; and, with ordinary aseptic precautions, it is quite safe. The child is laid on his side with his back bent forward as much as possible. A line drawn across the spine at the level of the upper border of the iliac crests will then be found to pass over the fourth lumbar spine. Just below it, in the fourth space, is the best site for the puncture. An ordinary exploring needle or fine trocar is passed into the interspace a little to one side of the middle line, to the depth (in a child) of $1\frac{1}{2}$ to 3 centimetres. Not more than half an ounce or an ounce should be removed even when the fluid is plentiful, except in special chronic cases. Should the fluid not flow easily, as if from obstruction, a stilette may be passed, but suction by

means of a syringe, or otherwise, should not be employed. After the puncture the patient should always be kept lying for twenty-four or forty-eight hours, if possible.

The cerebro-spinal fluid, in health, is clear and colourless, and under normal circumstances it comes through the needle slowly, drop by drop. In pathological conditions the fluid is often turbid, and its internal tension is sometimes so great that it spurts out. The amount of the fluid and its tension are usually increased in meningitis of any kind, in intra-cranial tumours, in uræmia, and in some cases of hydrocephalus.

The cellular content of the centrifuged deposit of the cerebro-spinal fluid is always important. Normally very few cells are found. In cases of acute meningitis the number is greatly increased. If, among these, lymphocytes prevail, this is in favour of a tuberculous process; while a polymorpho-nuclear leucocytosis is more characteristic of meningitis due to the meningococcus or to one or other of the ordinary pyogenic organisms. In the more chronic cases of non-tuberculous meningitis, and during convalescence in more acute cases, a lymphocytosis of the fluid may occasionally be found. Lymphocytosis of the cerebro-spinal fluid is also found in congenital, as in acquired, syphilis.

In tuberculous meningitis the tubercle bacilli are generally very hard to find in the cerebro-spinal fluid. In cerebro-spinal and pneumococcal meningitis the characteristic organisms are usually fairly easy of demonstration.

As a form of treatment, lumbar puncture has proved disappointing. Generally the relief of tension afforded by it (*e.g.* in meningitis) leads to no corresponding improvement in the symptoms. Occasionally, however, marked relief follows, even in acute cases. I have seen one case of chronic hydrocephalus, probably due to a cerebral tumour, in which periodic puncture repeatedly caused great relief of the

symptoms, which lasted, each time, for several weeks. When advancing chronic hydrocephalus in infancy is accompanied by convulsions and by screaming attacks, these may often be stopped by periodic withdrawal of some of the cerebro-spinal fluid.

CHAPTER XVII

ON CERTAIN FUNCTIONAL NERVOUS DISORDERS

Disorders of Sleep

Sleep may either be excessive or deficient in amount, or it may be disturbed and lacking in that peacefulness which is its characteristic in health; or nightmare or night-terrors may occur.

Excessive Sleepiness may be a symptom of digestive disturbance and of some liver affections. Generally, however, it is an indication of intra-cranial disease (see Drowsiness, p. 307).

Sleeplessness and Restlessness.—In infants, disturbed and interrupted sleep is most frequently due to indigestion or to insufficient food or drink, and its presence is always an indication that the diet needs careful looking into. It is also, however, often present under other circumstances. Thus it is characteristic of rickets, coryza, constipation, and other causes of discomfort; of eczema and other affections accompanied by itching; and of otitis, difficult dentition, phimosis, and other painful conditions. It may sometimes be due to cold. Sleeplessness, again, is an important symptom in septicæmia, pneumonia, and other feverish illnesses, and is also very characteristic of the early stages of congenital syphilis. So much is this the case, that I have more than once heard the mothers of syphilitic children refer to the grey powder they were taking as "those sleeping powders."

It must be remembered that, even in young infants,

wakefulness may be largely a matter of bad training and of excitement. A troublesomely sleepless baby in charge of a restless and vivacious woman will sometimes become a sound sleeper soon after he is taken over by a stolid, restful nurse. Sleeplessness is sometimes due to the child's being put to bed in a lighted room with adults talking near him. Defective ventilation is a very common and very important cause of restless sleep. Babies who sleep badly in bed will often sleep very soundly in their perambulators in the open air—and an open window in the sickroom is often the best soporific.

In older children, sleep is often disturbed as a result of indigestion and late meals, and of various local causes of discomfort, such as adenoids and cold feet. Difficulty in falling asleep at night is also often a sign that the school work is too much for the child's strength; and it is sometimes caused in nervous children by an undue amount of mental exertion or emotional excitement shortly before going to bed. It may sometimes, of course, be due to a constantly recurring cough.

The main treatment of sleeplessness is always that of its cause. When due to pain, as at the onset of pneumonia or pleurisy, an opiate such as Dover's powder is called for. If occurring under conditions of exhaustion, it is often best treated by stimulants. If there is abdominal uneasiness, a large poultice may be the best thing, or an enema of hot water, or even a dose of castor oil. Antipyrine and phenacetin are often useful when the cause of the sleeplessness is a temporary one, and especially during an acute feverish illness. In habitual wakefulness, however, drug treatment is bad treatment. The symptom is a danger-signal, and its cause, whether it consists in bad habits of life or in the persistence of some local irritation, must be found and removed.

Nightmare and Night-Terrors (*Pavor Nocturnus*).—

These conditions are commonly met with in children between two and eight years old. Some authorities, as Coutts,[1] regard them as essentially different. Others, as L. Guthrie,[2] see no clear line of distinction between them as to nature and significance. In nightmare the child wakes suddenly without apparent cause from a sleep which has usually been somewhat disturbed, and screams out, owing to having had a bad dream. In night-terrors proper, or the other hand, the sleep from which the patient awakes has usually been peaceful, and his screams are due to his having "seen visions" rather than "dreamed dreams." Thus he cries out that a big dog or black man is threatening him; or he mistakes his mother, standing at his bedside, for a horse about to run over him. In both, the attack generally sets in shortly after the child falls asleep—at the very time when, as A. Czerny has shown,[3] sleep is deepest; and it is not likely to recur the same night.

There are generally various elements in the *causation* of the condition, and the share of each is often difficult to apportion and to express. The general condition of the child's nervous system, as well as his age, is very important. Children of nervous families have these attacks more commonly and more severely than others. A family or personal history of rheumatism is also found in a certain proportion of cases. Some of the worst cases of night-terrors I have seen began immediately after a severe fright. Local sources of discomfort are often present; and such conditions as enlarged tonsils, adenoids, and chronic indigestion may be partly to blame. A late and heavy meal is, of course, a recognised cause of nightmare.

The *treatment* of nightmare and night-terrors consists in

[1] *Amer. Journ. of Med. Sci.*, Feb. 1895, and *Encyclop. Medica*, vol. viii. p. 360.
[2] *Allbutt's Syst. of Med.* vol. viii. p. 218.
[3] *Jahrb. f. Kinderheilk.*, xxxiii. H. I., p. 1.

attention to any predisposing and exciting causes which can be found. If adenoids or enlarged tonsils are present, the case is often permanently cured by their removal. In many cases, whether adenoids are present or not, attention to the diet will speedily remove the nervous symptoms. The restriction of starchy foods, vegetables, fruits, and sweets, combined with the administration of an alkali two or three hours after meals, often works wonders when the digestion is deranged (E. Smith). Regular night-terrors can often be temporarily stopped by a sufficient dose of antipyrine or some other sedative given at bed time; and the strengthening of the nervous tone by the administration of a carefully given cold douche at bed time has sometimes the best results.

It is, however, most important always to remember that the occurrence of such attacks urgently demands an investigation of, and probably a change in, the child's habits and surroundings as to diet, education, amusements, and hygiene.

Day-Terrors.—Attacks resembling night-terrors are occasionally met with during the daytime. As Still points out,[1] the causation, significance, and treatment of these is similar to those of the night seizures. They constitute an even more urgent sign of danger.

Somnambulism.—Somnambulism does not usually occur in children under ten, and it is met with mostly between that age and adolescence. Its significance and the general lines to be adopted in its treatment are the same as in night-terrors.

Insanity

Ordinary insanity is very rare in childhood, and practically unknown in infancy. When it does occur in young people, there is usually a strongly neurotic family history. Often, also, the patient himself has already shown other signs of a

[1] *Lancet*, Feb. 3, 1900.

weakly nervous system. Mentally defective children become insane not very uncommonly (Ireland).

Melancholia occasionally sets in after such exhausting complaints as influenza and enteric. It is apt to be associated with masturbation. A degree of mental depression is not uncommon in badly nourished children in the course of various bodily diseases. When it occurs in a chronic ailment such as valvular heart disease, it seems to have a bad prognostic significance.

Mania is sometimes associated with hysteria, sometimes with chorea. Occasionally it is in some way connected with a source of toxic poisoning (*e.g.* a focus of diseased bone). Most of the young children that I have seen with maniacal symptoms were epileptic; and many epileptic children show a considerable degree of mental exaltation during the intervals between their attacks.

A *temporary loss of moral control* is occasionally seen in boys of school age. When such cases are met with, it is important that they should not be mistaken for instances of permanent mental defect, and that prompt and sensible measures of treatment should be undertaken. The boy who comes of a neurotic stock, and has probably been subjected to a great nervous strain (severe bullying or other form of unsympathetic treatment, or perhaps exhausting bodily disease), becomes greatly changed in character and habits. He shows an entire lack of concentration in his school work, and becomes heedless, dirty, and untidy in his ways. He is untruthful, and has no sense of shame when found out, though morbidly afraid of punishment. He seems dull and unhappy, wanders about aimlessly, and talks aloud to himself. Punishments only make him more miserable.

In such cases immediate and energetic *treatment* is called for. The bodily health must, of course, be seen to; but the main thing is a complete change of the boy's whole surround-

ings. His ordinary lessons may have to be stopped, but it is advisable that a full routine of simple pleasant duties be instituted, so that he may have no time for loafing. He must be treated with the greatest kindness and encouragement, and every effort made to restore his self-respect and confidence.

With proper treatment, the *prognosis* is quite favourable. Such an attack, however, is a danger-signal, and is not to be forgotten in planning the boy's future work.

On Certain "Bad Habits"

No consideration of the nervous and mental derangements of infancy would be complete which omitted the consideration of the curious group of minor psychoses which, for want of a more distinctive name, are usually referred to as "bad habits." This very interesting group includes such tricks as pica or dirt-eating, sucking the thumb, tongue, etc., biting the nails, head-rolling, head-banging, rocking and swaying movements of the body, and masturbation.

All these habits consist in a morbid exaggeration of some insignificant normal action. The normal act causes little pleasure to the healthy child, while its morbid counterpart has an extraordinary fascination for the children who practise it. It may not, perhaps, be justifiable to say simply that these habits are infantile hysteria. They certainly, however, occupy among the diseases of infancy a very similar position to that held by various hysterical affections among those of later life. They are commonly met with, and are apt to be especially persistent, in children with other neurotic manifestations.

The essential character which serves at once to distinguish these habits from certain motor neuroses (*e.g.* spasmus nutans, chorea, habit-spasm) which some of them superficially resemble is their *deliberateness.* The child's will

is implicated, and what he does is done intentionally, at first at least—because he likes doing it. They have a strong tendency to occur when the patient is feeling dull and not taking an interest in his surroundings. They are almost always stopped when the child's attention is taken up with anything that interests him.

Pica or Dirt-Eating[1]

The children who suffer from this habit have a craving to eat such things as earth, gravel, cinders, sand, wall plaster, or paper—sometimes they chew and swallow their own hair, and in rare cases they will even eat fæcal matter. The natural instinct which tells us what is, and what is not, good for food seems absent in them altogether; and the discomfort which must result from the very abnormal things which they swallow does not teach them, as it ought, to avoid such things in future. They suffer, as it were, from a delusion of the appetite. In most cases there is no ascertainable general or local disease, and the children seem otherwise normal. Sometimes, however, we meet with "cachectic" cases. In these the craving begins with, and evidently depends largely on, a diseased condition of the alimentary tract, on the presence of worms, or on anæmia, and it passes off when these are cured. The practice is very common among mentally defective children.

Symptoms.—Pica is not at all uncommon, and generally begins in early infancy (six to eighteen months). As soon as the baby is placed within reach of the things he craves for, he tries to eat them. Thus, even before he can walk he will be found licking the mud from his father's boots or the dirt and gravel from the wheels of his own perambulator. When he begins to walk, he gets access to broken plaster on the walls, and later to all sorts of other things. In the distinctly

[1] "On Pica or Dirt-Eating," *Edin. Hosp. Rep.* vol. iii. p. 81, 1895.

cachectic cases, the symptoms may set in at any age for the first time. In many cases only one kind of unnatural substance is taken; in others, a great variety.

If the habit is taken in hand soon after it has begun, it may usually be rapidly checked by the mother or nurse. If it has been allowed to go on for months, however, it may be very hard to stop. In the early, "infantile" cases, there is a strong tendency to spontaneous recovery during the third or fourth year, when the range of the child's interests in life is rapidly widening. Sometimes, however, the habit persists into late childhood or adolescence. Change of scene—*e.g.* admission into a hospital ward—generally stops it at once. When it does persist, no serious harm usually follows. Fatal cases have, however, occurred from eating sand, gravel, or hair; and severe diarrhœa is not uncommon.

Treatment. — The indications for treatment may be stated as follows:—

1. *Keep the child away from the substances* for which he has a morbid craving. All habits are strengthened by practice, and their hold slackens under disuse.

2. *Treat the digestion.* Any local or general uneasiness tends to increase the craving.

3. *Improve the general health.* These habits have a far stronger hold on the weakly; the strong readily throw them off.

4. If possible, *change the child's surroundings* and occupy his mind with new interests. Let him be kept happy and busy.

Wetting the Hands.—Occasionally children are met with who have a constant craving to put their hands into water. This seems to be due to an incorrect sensation of dryness, the skin being really normally moist. It is a difficult habit to check. I have known it to last for many years.

Traces of **biting the nails** are very often seen (Fig. 41, p. 77), and callosities from constantly **biting the hands or fingers** are not uncommon especially in nervous children. In treating nail-biting it is helpful to keep all the nails cut as short as possible.

Sucking of the Thumb or Fingers, the Tongue or other Parts of the Body, or of other Objects[1]

The thumb and fingers are the parts most frequently sucked; less frequently the back of the hand, or part of the arm, or even, in young children, the big toe. The other objects made use of are such things as the mouthpiece of a feeding-bottle, a corner of the sheet or nightdress, a kneaded-up piece of bread, etc. Generally the same thing is sucked every time, but occasionally the child changes from one thing to another.

The habit is usually "simple," but often it becomes "complicated" in an interesting way. Thus a small boy who is punished for sucking his fingers gets into a way of covering his mouth with his other hand to hide what he is doing; he soon finds an added gratification from this "complication," and always uses it even when quite alone. Occasionally, also, cases are met with in which the children become violently excited while sucking, and injure themselves without seeming to notice it. For example, a patient of Lindner's, while sucking his thumb, worked with the little finger of the same hand in one of his nostrils, and did this so roughly that he made it bleed.

The habit of sucking usually begins in early infancy, but it may start at any time. The degree to which it gains a hold over children very largely depends on the passive, if not active, encouragement it receives from the

[1] Lindner, *Jahrb. f. Kinderheilk.* xiv., 1879, S. 68; Thomson, *Child-Study Monthly*, Chicago, June 1896, p. 98.

nurse or mother. The nurse finds that to check the habit means provoking no end of restlessness, screaming, and ill-temper; while, on the other hand, to encourage it is a very easy and almost infallible way of making the child quiet and easily managed—"good" she calls it.

The times when children are most tempted to suck their fingers, etc., are shortly before falling asleep, soon after waking, and soon after their bath; also whenever they are in a low or depressed state of body or mind, or are cold, hungry, or out of sorts. The duration of the habit varies greatly in different cases. Sometimes the nurse or mother weans the child from it very soon. Sometimes it is allowed to continue till the child goes to school, and then only slowly ceases owing partly to the notice of his schoolfellows.

Sucking usually does little harm unless it is much indulged in or is accompanied by excitement, but it should, practically always, be discouraged. I have, however, seen one case where a baby with very severe paroxysms of whooping-cough was more soothed by being taught to suck a "comforter" than by any sedative medicine.

Treatment.—In cases where the sucking is accompanied by excitement, it is important, though sometimes very difficult, to stop the habit. When the finger or thumb is used, this may be best effected by the application of a light anterior splint or a stiff cardboard sleeve to the arm, so that the elbow cannot be bent. Anointing the part sucked with aloes or quinine is also sometimes helpful. Generally, if left alone, the habit comes to an end of itself as the child grows older.

Sucking the tongue usually begins in early infancy, and is difficult, if not impossible, to stop until the child comes to years of discretion. It occurs in at least 80 per cent. of mongolian imbecile babies, and in a doubtful case of mongolism its presence is a distinct point in favour of the diagnosis (p. 430).

Rhythmical Movements

Rhythmical movements of various parts are sometimes met with in children. These are of the nature of bad habits, but are apt to be mistaken for neuroses of another kind.

One of the most striking habits of this class has been described by Dr. Gee[1] as *head-banging*. The patient, who is generally a child between two and six years, takes turns of facing his pillow and banging his forehead into it as hard as he can, at regular intervals of a few seconds. This goes on sometimes for several minutes, sometimes for as much as an hour at a time. It may alternate with swaying of the body or head-rolling, or some other habit. It takes place in some cases when the patient is wide awake, and sometimes when he seems nearly or quite sound asleep. The patients are sometimes deficient in intellect, and sometimes they are cachectic (*e.g.* tuberculous).

Another similar habit consists in rhythmical *jerking or rolling the head from side to side* as it lies with the occiput on the pillow. Or the child may have deliberate *nodding or shaking* movements of the head while sitting up,[2] which look like an exaggerated and intentional form of spasmus nutans.

Another and a commoner variety consists in a *swaying or rocking* backward and forward of the trunk. The children sit, with a solemn expression, and slowly rock themselves forwards and backwards, sometimes for hours at a time, if left alone. This habit is very common in mentally defective children and also in the blind, but it occurs too at times in normal children. It is often associated with one or other of the habits above described or with masturbation; and

[1] *St. Bart. Hosp. Rep.* vol. xxii., 1886, p. 97.
[2] Thomson, *Scot. Med. and Surg. Journ.*, July 1900, p. 11.

it is often erroneously regarded as merely a variety of the latter.

Treatment.—A child who is commencing to practise it should at once be checked, and he should be made to stand up and to run about or to lie down whenever it begins. In normal children who can walk this habit is not difficult to check.

Masturbation

Every now and then we are consulted about masturbation in children. The children may be of any age, but in the majority of cases they are infants. Girls are much more frequently brought to us on this account than boys. This is partly because in them the nature of the symptoms is more apt to be overlooked and the movements attributed to internal distress of some kind or a fit, or to some other obscure nervous seizure.

Symptoms.—The act is practised in various ways—*e.g.* by rubbing the thighs together, or by rubbing the body to and fro on the seat on which the child is sitting, or by pressing the vulvar region against the corner of a chair, or some other hard body, or, less frequently, by help of the hands. The child seems intensely preoccupied at the time, and gets flushed and excited, and often perspires. A sort of panting or grunting expiration often accompanies the act; and mothers not infrequently refer to this as showing that the child is suffering. If the movements are stopped, however, the children always show signs of annoyance. If the act is not interfered with, evident indications of exhaustion generally follow it.

Treatment.—The treatment of confirmed cases of masturbation in *older children*, who know that they are doing wrong, is often excessively difficult, and in planning it we have to be largely guided by the circumstances and surroundings of the case. In *young children*, however, the matter of

cure is comparatively simple and hopeful. In them the habit is in no respect a moral offence, and it must not be treated as such. The parents' attitude towards it should be firm but altogether unemotional. They should, in fact, treat it simply as they would any gross breach of ordinary good manners. The main indications for treatment are as follows:—

1. *Remove any local irritation present.* Phimosis, balanitis, vulvitis, hyperacidity of the urine, thread-worms, etc., must be looked for and treated.

2. *Attend to the general health and hygiene.* See that the diet is judicious and not too nitrogenous, and the bed clothes not too heavy. Order a cold douche in the morning and plenty of open-air exercise.

3. *Take effective means to prevent the act mechanically.* In young children this is the most important indication of all. Where the children are young enough, and those in charge are sufficiently methodical, to allow of its being satisfactorily carried out, the prognosis as to rapid recovery is very good. In children past four or five years, however, little can usually be done in this direction. The nature of the apparatus needed depends on the way in which the habit is practised. If the hands are used, the arms should be put up in rectangular splints. If the thighs are rubbed together, some sort of splint or other contrivance must be devised to hold the knees apart. The use of any mechanical restraint must, of course, be accompanied by ceaseless watching on the part of the mother or nurse all the time of waking. The times when special vigilance is required are before falling asleep and on waking in the morning. Whenever the movements begin, the child must at once be made to change her position and to do, or to take interest in, something else. If she is lying, she must be made to sit up, and, if old enough, to get up and run about. If this line of treatment can be carried out with any degree of regularity,

the soothing character of the habit will be destroyed, and it will rapidly lose its hold on the child.

4. *Get the child's thoughts off the habit as much as possible.* It is, of course, right that the disapproval of the parents and nurse should be felt by the child. Much punishment, and especially much talking to, however, often do great harm by accentuating the importance of the subject, and making the child think too much about it. A complete change of surroundings and of subjects of thought is one of the strongest influences for good in the treatment of these cases.

Epilepsy

Ordinary idiopathic epilepsy, in the form of grand mal or petit mal attacks, may begin in early childhood. It is certain, however, that a large proportion of cases which at first look like regular epilepsy turn out later to be merely symptomatic convulsions. They may, for example, prove to be due to past or present organic disease of the brain. Oftener they are of the nature of functional disturbances set up or predisposed to by pyrexia, intestinal dyspepsia, phimosis, adenoids, refractive anomalies, etc., in children with impressionable nervous systems. This happens not infrequently in older children as well as in infants.[1]

The question whether, in a given case, the convulsions are idiopathic or merely symptomatic of a passing disturbance, is of the greatest importance with regard to the prognosis. It is, of course, often impossible to speak positively on the point at the time of the first convulsions, and our opinion must always be guarded. The following particulars, however, have considerable significance. If symptoms of dyspepsia, lithæmia, fever, etc., are present, and especially if they were also observed on the occasion of former convulsive seizures, this is strongly in favour of the case being

[1] Eustace Smith, *Lancet*, Jan. 24, 1903, p. 221.

symptomatic. On the other hand, the presence of a family history of epilepsy is strongly in favour of the idiopathic nature of the case. A large proportion of the children who suffer from idiopathic epilepsy have also more or less marked mental peculiarities. Sometimes there is merely a degree of dulness or depression; often there is a tendency to mental exaltation, an abnormal absence of shyness, a want of balance, or great uncertainty of temper. The presence of any peculiarity of this kind greatly increases the probability that the case is one of true epilepsy.

Treatment.—In beginning the treatment of a case of epilepsy, attention should first be directed to any of the above-mentioned local conditions which may possibly be causing reflex irritation. Sedatives—especially bromides—are of considerable, although limited, value. It is important to watch their effect on the general health, and to stop them if it is not satisfactory. Bromide of soda or potash may be given in doses of grs. v thrice daily to a child of twelve months, and grs. x to one of three to five years. The salt should be largely diluted. If the fits tend to recur at a certain time of day, a double dose may be ordered shortly before they are expected. If the bromide is to be given for a long time, it is well to combine with it a small dose of liquor arsenicalis, in order to lessen the tendency to the production of a bromide eruption. Should the circulation be feeble, and if the fits occur only at night, considerable benefit often follows the administration of digitalis either alone or with the bromide. Borax is sometimes very useful in cases in which bromide fails. From grs. ii to v thrice daily forms a suitable dose for children from three to six years. When the attack is preceded by an aura, it may sometimes be averted by the prompt inhalation of amyl nitrite. Occasionally the sniffing up into the nose of powdered chloride of sodium has a similar effect.

In regulating the diet of epileptic children, the main thing to inculcate is strict moderation at all times. The ideal to be aimed at is not great restriction, but small simple meals eaten with an appetite. It is certainly advisable not to allow much butcher meat, and many children probably do best without any. But it is just as important not to allow an excess of starchy and sweet foods to children whose intestinal digestion is weak. The action of the bowels must be regular and free. Plenty of open-air and regular moderate exercise, without excitement, are very beneficial.

The question of schooling, and of how the child is to spend his time, is an extremely important one. On this matter we must give positive directions, and not merely forbid lessons and say that the child is to run wild. As Dr. Ashby excellently puts it,[1] "If 'running wild' means involuntary idleness, an aimless and empty existence without discipline and control, and a more than ever concentration on self, then 'running wild' is the worst possible treatment for fits. By all means arrange for many hours in the open air, but find objects of interest, outdoor work, and outdoor play. Then consecrate some part of the day, be it only a couple of hours, to some indoor employment. There is no real fear of overworking juvenile brains if the subject-matter is not concerned with desks and books, but is made interesting, and the employment and lessons are short and varied, and intervals of outdoor relaxation are frequent. The child is a social animal, and the society of other children, if well under control, has a powerful influence for good; and the more neurotic the child, the more need is there for his contact with others. To allow the neurotic child to feel that he is the first to be considered, to let him think that every little ache, every little disappointment, and every discomfort are sore trials, is to be doing all that can be done to blight his future. Give him daily

[1] *Lancet*, Jan. 21, 1905, p. 138.

employment, everything well within his powers, and look for accurate performance. Defer if you will all abstract learning to a later day, but find for him an active and occupied life; lend him a firm hand that may help to forge and strengthen the links of voluntary power and self-control, which will prove important factors in preventive medicine and save many a sorrow."

Hysteria

Manifestations of hysteria are rare in children under six years, but occasionally they are met with in a marked form even in infants of two years old. As has been already pointed out (p. 347), the place occupied by hysteria in later life seems to be taken to a large extent in infancy by various of the so-called "bad habits."

In children between nine years and puberty who belong to neurotic families, hysterical affections are not uncommon; and boys are often affected, though not so frequently as girls. In these older children also hysterical symptoms are apt to be associated with chorea, habit-spasm, epilepsy, and various forms of mental disease.

Symptoms.—Hysteria may manifest itself in childhood, as in later life, either by motor, sensory, or psychical symptoms. The symptoms are usually less complicated than in adults. Among the sensory disturbances, hyperæsthesia or pain on movement of some part is common. Headaches also are often complained of. Anæsthesia is sometimes, but not often, found. Hysterical joint affections have been already dealt with. Motor symptoms, such as contractures of the limbs, or, less commonly, paralysis, are often seen, and the muscles of the larynx are among those most often implicated. Hysterical vomiting is not very rare in girls. The mental condition in hysterical children is generally characteristic. They show the usual intense interest in their symptoms and a distinct gratification in talking about them. In older girls we

sometimes meet with mental depression and peculiarity accompanied by anorexia and obstinate constipation.

The **diagnosis** of hysteria is made, as in adults, mainly by excluding the presence of organic disease sufficient to cause the symptoms. We must, of course, always bear in mind the *possibility* of organic disease and hysteria being co-existent.

The **treatment** is generally very satisfactory, provided the child can be removed at once to a hospital or nursing home or to the house of a judicious friend. Such a change of surroundings, with the elimination of morbid sympathy, is often all that is necessary for a rapid cure. Sometimes, however, a good deal of patience as well as tact may be required.

When the child is emaciated and has loss of appetite and constipation, a course of general massage and feeding-up (Weir-Mitchell) are of great value. If the limbs are affected, local massage, faradism, and douching are indicated. Laxative and tonic medicines have a useful function, and sometimes valerian is markedly beneficial. During such bodily treatment it is of the greatest importance that every effort should be made to make the child happy and hopeful, and to transfer her interest from herself to other things. Bad habits should be watched for and checked if present.

When the patient has begun satisfactorily to improve, she will benefit greatly from thorough change of scene, and nothing is better for her than the varied open-air interests of country life. When her health seems re-established, a happy, well-regulated school life will be very useful in promoting healthiness of mind and preventing recurrence of the hysterical symptoms.

Habit-Spasm (*Simple Tic and Convulsive Tic*)

Symptoms.—This is not very uncommon, in both boys and girls, between six years old and puberty. It generally

appears in those whose bodily strength has been lowered by illness or bad feeding, or who are suffering from nervous strain from mental overwork, worry, or shock of some kind. The jerking movements affect the face and head more frequently than other parts; and we often have blinking of the eyes, screwing up of the nose, or other similar grimaces. In other cases there is a sudden nod or shake of the head, or a shrug of the shoulders. Sometimes there are grasping and other movements of the hands or twitching of the lower limbs or trunk. Very often, in the severer cases, there is a tendency to repeated noisy clearing of the throat, or to the sudden ejaculation of some word. The word repeated in this way is apt to be a specially inappropriate one (coprolalia).

In typical cases, the movements differ considerably from those of ordinary chorea, being shorter, quicker, and less extensive, and also being repeated over and over again in the same way instead of being very irregular. Another point of difference is the effect which the presence of onlookers has on them. The movements of habit-spasm are usually diminished or even suppressed when the child is being watched. Under similar circumstances the movements of ordinary chorea are generally exaggerated. Slight atypical cases may sometimes at first be easily mistaken for chorea. In addition to the characteristic movements, the children often show excitability, irritability, passionateness, and obstinacy: many of them sleep badly or suffer from headaches. They are often very clever children. Unlike chorea, habit-spasm sometimes spreads by imitation. Unlike chorea, also, it may, if not successfully treated, last for several years.

The **treatment** of this apparently trivial complaint is often extremely difficult and disappointing. As Dr. Still truly says,[1] "there are few disorders of childhood out of which the medical attendant is likely to gain less credit."

[1] "Habit-Spasm in Children," *Lancet*, Dec. 16, 1905.

The fact of the disease occurring at all shows that the child's nervous system is in a thoroughly unsatisfactory state, and in all well-marked cases, before we can hope for recovery, a complete change in his surroundings and in his ways of life is called for. A rapid cure can never be expected. The main indications may be stated as follows:—

1. To begin with, the child's mental condition must be seen to. All sources of distress, such as fear of punishments or bullying, must be got rid of. The child must receive every encouragement, and his mind must be kept fully occupied in a pleasant way.

2. If the movements are severe, the patient may be urged to use his self-control to check them, but anything like punishment on account of them, or even severe scolding, is most injudicious.

3. School attendance must, of course, be stopped. It is often advisable, however, that an hour or two of lessons should be given daily. The subjects chosen should, at first at least, be those to which he has least objection.

4. The child should be encouraged to sleep as long as possible, and all causes of excitement should be avoided.

5. He must, if possible, be made fat. In severe cases it is generally a good plan to begin with a course of Weir-Mitchell treatment. Generally, however, moderate exercise, feeding up with extra milk, etc., and a healthy out-of-door life, is what is wanted.

6. Any probable source of local irritation, such as adenoids or refractive errors, should be attended to.

7. Drugs are not of much use in most cases. If the child is anæmic, however, he may benefit greatly from a course of iron. A combination of arsenic and bromide of potash is recommended by some. Still has seen benefit from ergot and nux vomica (ext. ergot. liq. ℥ss to ℥i, tinct. nuc. vomic. ♏v t. i. d.). Valerian seems also, at times, to have a good effect.

Electricity has been used much, and is thought sometimes to do good.

Chorea

Chorea is essentially a disease of childhood, and is met with most commonly between the ages of five and fifteen years, and more frequently in girls than in boys. It is a subacute disease, lasting generally from six to ten weeks or more, and showing a strong tendency to recur. In exceptional cases it may last for as much as a year or even more; but certainly the great majority of so-called "chronic choreas" are really instances of habit-spasm, or of Friedreich's ataxia or some other organic disease of the central nervous system. In a considerable proportion of cases, chorea is beyond all doubt a manifestation of rheumatism. Its occurrence, therefore, should always suggest a thorough investigation as to the presence or history of subcutaneous nodules, joint pains, heart lesions, and other rheumatic symptoms.

Symptoms.—The main characteristic of an attack of chorea is the faulty control of her muscles which the patient shows. This takes three forms: (1) There is *inability to keep still.* If the child is told to keep her hands lying flat on the bed clothes in front of her, she is unable to do so for any length of time, and the asking of a simple question will almost invariably set them twitching. (2) There is usually more or less marked *inco-ordination*, and the patient may have great difficulty, *e.g.*, in picking up a pin or in handling anything carefully. She tends to drop things she is carrying, however anxious she is not to do so. (3) There is always present a degree of *paresis*, and in some instances this symptom is so marked as to cause the case to be mistaken for one of paralysis of some kind unless it is carefully examined. The paresis of chorea should, however, be easily recognised. It always sets in gradually and is never absolute. The muscles are flaccid, and there is no wasting.

Some slight irregularity of movement will always be recognisable if looked for.

As Dr. Lees points out,[1] it is precisely the muscles over which we have most voluntary power, and those by which we are accustomed to express emotion, that are most affected in chorea, *i.e.* those of the face, tongue, hands, and arms. In slight cases the movements are sometimes apparently confined to one side.

Although the disorderly muscular movements are usually the most striking symptom of chorea, the mental and emotional changes which occur are probably equally characteristic and important. The child is changed in disposition and temper and is subject to emotional outbursts. There is often a state of temporary mental dulness with loss of memory, and more or less complete aphasia is common. In estimating the extent to which chorea has affected the mental functions, it must be borne in mind that the disease often affects children whose mental power is, to begin with, rather below the average. In such cases the duration of the muscular symptoms is apt to be unusually prolonged.

Treatment.—In commencing the treatment of chorea, we must not forget the large part which emotional disturbance plays in the causation of the disease, and we must aim at *setting the mind at rest*. With this in view, the child must be protected from all cause of annoyance from without, such as the presence of other children or strangers is apt to bring. She must also be encouraged and made to feel that her disorderly movements are not in any way blameworthy and that she will soon get well. Her mind should, if possible, be taken off herself in a pleasant way by simple amusements, so that she may not weary and become depressed. At the same time it is very important

[1] "The Pathology and Treatment of Chorea," *Brit. Med. Journ.*, Aug. 29, 1903.

that she should not be given in to or spoiled; and many cases will be better if nursed by a kindly stranger in new surroundings than amid the more relaxing influences of home.

The patient should always *be put to bed* at first and kept there for a varying number of weeks, according to the severity of the case. She should, if possible, be nursed in a room apart from the other children. When the muscular movements are very violent, it may be necessary to have the iron framework of the bed padded; and, in the worst cases, a water-bed is desirable.

A *fair amount of nourishment* must be given in an easily digestible form. For this purpose nothing is as good as milk, of which large quantities should be ordered. Many children, however, fret and do not gain weight if kept on milk alone, and for them the addition of farinaceous food is markedly beneficial. If the child gains weight steadily, it is a very good sign. While the child is being fed up it is most important that the bowels should be kept regular. Regular *massage* is a very useful aid to the nutrition.

Warm baths are useful as a soothing measure, and in cases where the movements are unusually violent, the application of hot packs has often an excellent effect. In the not very common case of sources of *peripheral irritation* existing, such as refractive errors, adenoids, or worms, it is important to have them treated.

The *medicinal treatment* of chorea is a matter on which a good deal of difference of opinion exists. Of the great value of drugs in suitable cases, I, personally, have no doubt. There are, however, many cases in which the use of any medicine is unnecessary and undesirable, as the child recovers rapidly and satisfactorily if kept quiet in bed, fed up, and massaged. In other cases, however, no decided improvement occurs until drugs are given. It may be regarded as always

advisable, unless anti-rheumatic treatment seems called for, to defer the administration of medicinal remedies until the effect of isolation, rest, suitable feeding and massage have been tried for a week at least. When large doses of any remedy are being given, it is of course necessary that the patient be confined to bed.

The medicines of which I have had experience are salicylate of soda (with bicarbonate), arsenic, antipyrine, and ergot. The details of their administration are as follows:—

Salicylate of Soda with Bicarbonate.—Large doses of salicylate of soda have been strongly advocated by Dr. D. B. Lees,[1] on the ground that chorea is often, if not always, a manifestation of cerebral rheumatism. He holds that, as in cerebral syphilis specially large doses of iodide are necessary, so in chorea more salicylate is desirable than in rheumatism of other parts. He recommends that the dose for a child of six to ten years should be at first 10 grs. with 20 grs. of sodium bicarbonate. After two or three days the quantities should be increased to 15 grs. and 30 grs. respectively. After two or three days more, they may, if necessary, be increased to 20 grs. and 40 grs. These doses should be given every two hours during the day and every four hours during the night—ten doses in the twenty-four hours. Thus the total amount of salicylate given at first is 100 grs. daily, increased to 150 grs. and later to 200 grs. In some cases Dr. Lees gives as much as 300 or even 400 grs. to older children.

A careful watch must, of course, be kept for any symptoms of salicylate poisoning, and especially for a peculiar deep inspiration accompanied by acetone in the breath and in the urine, which simulates the "air-hunger" of diabetes.[2] If this symptom occurs, the medicine must immediately be

[1] *Brit. Med. Journ.*, Aug. 29, 1903, p. 450.

[2] Fred. Langmead, "Salicylate Poisoning in Children," *Lancet*, June 30, 1906, p. 1822.

given up, for it is a sign of danger. It is, however, a rare phenomenon. The bicarbonate is given to prevent this "air-hunger." It is also very important that the bowels should be kept freely open.

After considerable experience of this method of treatment (with the smaller doses up to 100 grs. in the day), I am inclined to prefer it in all cases where there is either a rheumatic history or any rheumatic manifestation, besides the chorea, present. Occasionally vomiting occurs, and the drug seems to depress the pulse. The depressing effects of sodium salicylate have certainly, however, been greatly exaggerated. In the vast majority of cases they are quite inappreciable. When vomiting occurs, the drug should be stopped for a day or so and then recommenced. It is a striking and significant fact that under this treatment children often gain weight steadily.

Arsenic.—Arsenic must always be given with great caution and according to precise rules. Otherwise neuritis may result, and arsenical neuritis is sometimes not wholly recovered from. It is safer, as well as more efficacious, to give the drug in large doses for a short time than to use smaller quantities for a longer period. Dr. William Murray[1] recommends 15 min. of liquor arsenicalis, well diluted, with food, thrice daily for a child of six or eight. This must never be continued for more than a week. This caution is generally, however, unnecessary, as the arsenic has usually to be stopped by the fourth or fifth day on account of vomiting and other indications of poisoning. The effect of these large doses is often very striking, and even severe cases may be almost cured in about a week.

The symptoms of arsenical poisoning, other than vomiting, which are to be looked for are a general flushing of the skin, redness and itching of the eyelids, a white fur on the tongue,

[1] *Rough Notes on Remedies*, 3rd ed., 1899, p. 16.

diarrhœa, and sometimes a rise of temperature with albuminuria. They are most apt to occur when the dose given is small at first and is steadily increased for more than a week. When the medicine is discontinued the symptoms rapidly pass off.

Before beginning to give arsenic in any case, it is essential to ascertain for certain whether the patient has been having the drug already. Otherwise there may be grave danger of too much being given.

Antipyrine.—To be effectual, antipyrine must not only be given in considerable quantities, but in large doses at a time.[1] The dose should amount to 1½ gr. for each year of the child's age (*e.g.* 15 grs. for a child of ten years). It should be given twice on the first day, thrice on the second, four times on the third, and five times on the fourth day. It should then be continued five times a day for about a fortnight.

Before giving antipyrine in this way, the urine must always be examined to see that its quantity and sp. gr. are normal, and that it is free from albumin, and its characters should be watched while the drug is being administered. Occasionally an antipyrine rash may occur with or without albuminuria and vomiting. These symptoms rapidly subside on the medicine being stopped. I have never seen any symptoms of collapse following the above doses of antipyrine. Its effect on the choreic movements is generally most marked.

Ergot.—Dr. Eustace Smith has strongly recommended the use of ergot in chorea.[2] He gives drachm doses of the liquid extract every three or four hours to children of all ages, and increases it to a drachm and a half every two hours, if necessary. These large doses are generally borne quite well, and they should be continued for weeks, until the abnormal muscular movements have ceased. Sometimes, however, the

[1] Jules Comby, *Arch. de Méd. des Enfants*, April, 1899.
[2] *Brit. Med. Journ.*, July 18, 1903, p.133.

drug has to be stopped on account of sickness and weakening of the pulse. There is no risk whatever of ergotism with such doses. The effect on the choreic movements is often rapid and striking, but the amount of nausea sometimes produced has seemed to me to make it rather an unpleasant form of treatment.

Convalescence.—When the patient is convalescent, change of air and scene are very beneficial. Gymnastic exercises and musical drill are also useful in helping her to recover complete control over her unruly muscles. Iron and other tonics are sometimes indicated.

Spasmus Nutans

(*Head-Shaking with Nystagmus in Young Infants*)

This is a functional co-ordination neurosis affecting infants under two years, and is seen mostly in poor children who live in dark rooms. It generally begins between the fourth and twelfth months—at an age when the baby is spending much of his time and energy in perfecting himself in the difficult art of raising his head, turning it round, converging his eyes, and focusing his accommodation.

Symptoms.—The two principal symptoms—involuntary nodding or shaking of the head and ocular nystagmus—are usually both present, but either may begin some weeks before the other. Sometimes, however, head movements alone are observed; while in other cases only the peculiar nystagmus is seen. The movements of the head may consist in simple forward nodding, but lateral or rotatory shaking is commoner. They cease when the child is lying down, and also when the eyes are closed, voluntarily or otherwise. The nystagmus is rapid and of short range. Its peculiar characters have already been described (p. 323); and they are so distinctive that it is easily recognised, even when unaccompanied by head movements. The nystagmus is generally increased in extent

when the head is held steady, and sometimes it only appears when the head is fixed.

Rhythmical contraction and dilatation of the pupils (hippus) may sometimes be found; and, occasionally, convergent strabismus develops. The child has often a peculiar trick of turning his head to one side and staring fixedly out of the opposite corners of his eyes—usually in an upward direction. This gives him a curious preoccupied look. The exact explanation of this symptom is obscure, but there seems no good reason to regard it, as some have done, as a sort of petit mal attack. The intellect is never at all implicated as a result of spasmus nutans. It should, however, be mentioned that children whose intelligence is below the average seem to be specially prone to be affected with this disease. The movements of the head are, to a large extent, beyond the child's control. They are noticeably increased when his attention is aroused. For this reason they are generally at their height when the child comes through crowded streets to the waiting-room. They diminish with drowsiness, and cease during sleep.

The symptoms usually begin suddenly, almost always in mid-winter. They seldom last less than six weeks, usually for three to six months, and sometimes for longer. The condition always ends in complete recovery, with the exception that, should strabismus occur, it may be permanent. Occasionally there is a recurrence of the symptoms in the following winter, but this is rare.

Causation.—The causation of this disease, like that of chorea, is somewhat complicated.[1] Among the chief factors we may reckon the child's age, the absence of

[1] W. B. Hadden, *Lancet*, June 14, 21, and 28, 1890, and *St. Thomas Hosp. Rep.* vol. xx., 1890; R. W. Raudnitz, *Jahrb. f. Kinderheilk.* Bd. xlv., 1897, p. 144; H. Rietschel, *Charité-Annalen*, Bd. xxx., 1906, p. 152; Thomson, *Scot. Med. and Surg. Journ.*, July 1900.

sufficient sunlight in his surroundings, and the presence of rickets. Falls on the head and the irritation of teething seem sometimes to act as determining causes, and anything that lowers the general vitality may probably be regarded as predisposing.

Diagnosis.—Spasmus nutans is generally easy to recognise. Eclampsia nutans, or the "salaam convulsion," has sometimes been confounded with it. It is, however, quite a different disease, being a form of epileptic seizure met with in mentally defective children and associated with grave cerebral lesions.

The deliberate rhythmical jerking or shaking of the head in neurotic children, referred to in a former chapter (p. 352), is also easily distinguished from spasmus nutans. In it the movements have a wider range, nystagmus is absent, and the head-shaking ceases when the child's attention is arrested and increases when he is left to himself. It is also generally seen in older children.

Treatment.—Spasmus nutans usually improves steadily and satisfactorily under anti-rachitic and tonic treatment. The chief thing is to secure abundance of fresh air and sunshine, and to give cod liver oil and phosphorus. While sedatives such as antipyrine certainly seem, in some cases, to diminish the movements, they cannot be held to be of much importance.

Tetany

This condition is characterised by a peculiar tonic spasm of certain muscles of the extremities, of reflex origin, which causes the limbs, and especially the hands and feet, to assume characteristic postures. It is most commonly met with during the first three years of life, but also sometimes occurs in older children. In the great majority of cases the attack sets in during the spring months.

Symptoms.—The onset of the symptoms is generally

sudden, but in most cases the child has already been suffering from more or less severe diarrhœa. The attitude which the limbs assume is very characteristic. The elbow is flexed, the wrist often slightly also, and the hand, owing to spasm of the interossei, assumes the so-called "accoucheur's position" (Figs. 95 and 96). The fingers are somewhat flexed at the metacarpo-phalangeal and fully extended at the inter-phalangeal joints. They often overlap one another, and the thumb crosses the palm, so that its tip touches the middle phalanx of the ring finger. In some cases in young babies the fingers are simply flexed to an extreme degree into the palm, and the thumb is either doubled under them or projects between two of the proximal phalanges. Various transitional postures are met with, such as are seen in Fig. 97.

The lower limbs are usually affected along with, but sometimes without, the upper. The front part of the foot becomes contracted so as to cause an antero-posterior furrow on the sole, and there is also extreme plantar flexion of the toes. In rare cases the muscles of the back and neck are implicated, causing slight head retraction with rigidity.

The muscular contractions vary in severity from time to time, and in severe cases present regular recurring spasms. During these there is often some redness, tenderness, and swelling of the dorsum of the hand or of the instep, so that cases have been mistaken for rheumatism. During the intervals between these spasms they can often be brought on again by compression of the main artery or nerve of the limbs (Trousseau's symptom). The contraction affects both sides of the body at once, but sometimes one side more severely than the other. The contraction generally passes off in a few days, but in severe cases it may last for weeks or even months. Relapses are very common.

Slight attacks of tetany, in young children, have often been spoken off as "carpo-pedal contractions," and several

FIG. 95.—Tetany. Girl aged 13 months.

FIG. 96.—Tetany. Girl aged 9 months.

FIG. 97.—Tetany. Boy aged 7 months.

authorities have been of opinion that these cases should not be called tetany. While it is certain, however, that the tetany of older children and adults differs somewhat from that in young babies both in its causation and usually in its course, still the symptoms are so similar in the two sets of cases, and there are so many transitional cases, that it seems unreasonable to designate them by different names.

In the ordinary mild cases of tetany commonly met with in young babies, evidence of active rickets is practically always to be found; and one, if not more, of the other so-called "rickety neuroses" (Chvostek's symptom, laryngismus, and convulsions) is generally present also (p. 481).

Causation.—Apart from its connections with gastro-intestinal disease and with rickets, little is known regarding the etiology of tetany in children. It is not very uncommon to find more than one case occurring in a family. It is almost exclusively met with, in Edinburgh at least, in the early months of the year (January to May), and this has probably something to do with the fact that cold easterly and northerly winds prevail during these months more than at any other season. In some years tetany is unusually prevalent, and it is probable that this also is to be attributed to there having been in them a larger proportion than usual of such cold winds.[1]

Diagnosis.—This should present no difficulty. Occasionally severe cases may, however, be mistaken for cerebro-spinal meningitis; and, as already mentioned, the swollen hands and feet have been attributed to rheumatism.

Prognosis.—Tetany is generally a passing and trivial affection in little children, except in those cases in which it is an accompaniment of serious bowel disease.

Treatment.—In most cases the treatment should be begun by the administration of rhubarb and soda and such

[1] J. Pirie, *Edin. Hosp. Rep.* vol. i., 1893, p. 400.

dieting and medication as are necessary to cure the intestinal derangement. The next indication is careful attention to the rickets present. When the spasmodic contraction of the extremities is so severe as to cause pain, chloral or some other sedative may be required. In obstinate and recurrent cases in older children the administration of thyroid substance may be tried, as it has occasionally proved markedly successful. In the tetany of young rickety children it has, in my experience, no effect at all.

CHAPTER XVIII

ON CERTAIN FORMS OF PARALYSIS AND OF MENINGITIS

The various forms of paralysis met with in children may be conveniently divided into two groups, according as the symptoms have dated from birth or have set in during infancy or later childhood.

Paralyses dating from Birth

Paralysis which is present from birth is frequently due to intra-uterine disease or arrest of development. In many cases, however, it is the result of some traumatic injury during the process of delivery. These forms of disease are therefore often spoken of as "obstetrical paralyses" or "birth palsies." The injury may implicate the nerves or the brain; the spinal cord is very rarely affected.

PERIPHERAL BIRTH PALSIES

In these cases either the face or the arm, or rarely both, may be paralysed; the lower limbs are very rarely involved, because their nerves lie more deeply, and are therefore better protected from external injury.

Facial Paralysis is sometimes met with in new-born children as the result of pressure on the facial nerve during delivery. The cause of the injury is generally the forceps, but in rare instances the promontory of the sacrum may be to blame. The paralysis is usually recovered from in a few

days, or at most within a fortnight. Occasionally, however, it may last for months or even become permanent.

The diagnosis of these cases seldom presents any difficulty. The only condition which may be mistaken for it is *congenital defect of the nucleus of the 7th nerve.* This has been occasionally described,[1] and should be borne in mind when facial paralysis is present at birth after an easy labour. Should both sides of the face be affected, or should one or more of the ocular muscles also be implicated, these are points in favour of this diagnosis.

The treatment of facial paralysis from birth injury is largely expectant. If the recovery is delayed, however, gentle massage and mild faradism may be used.

Paralysis of the Arm arising during delivery is due to injury of the cords of the brachial plexus. It may occur in head presentations, but is much commoner in breech cases. The injury may be inflicted by the end of the forceps or other obstetrical instrument, or by the finger of the accoucheur. Sometimes it results from severe traction on the arm or lateral twisting of the head during the extraction of the child. Occasionally both arms are affected.

In the great majority of cases it is the upper cords of the plexus (5th and 6th) that are implicated, and the paralysis is of the "upper arm type" (*Erb's paralysis*) (Fig. 98). In these the position of the arm is very characteristic. The shoulder is fixed and the elbow fully extended, while the humerus is rotated inwards and the forearm pronated so that the palm turns backwards or even outwards. After a few weeks have passed there is flattening of the shoulder and atrophy of the upper arm. The forearm is not wasted, and the hand movements are little interfered with. The muscles

[1] H. M. Thomas, *Journ. of Nervous and Mental Disease*, Aug. 1898; Heubner, *Charité-Annalen*, xxv., 1900; Rainy and Fowler, *Review of Neurol. and Psychiat.*, March 1903.

involved in a typical case are the deltoid, biceps, and brachialis anticus, the supra-spinatus and infra-spinatus,

FIG. 98.—Erb's Paralysis of Both Arms. Girl aged 3 months. Breech presentation. (Dr. Peter Davidson's patient.)

the teres minor and the supinator longus. No sensory changes are discoverable.

The lower arm type (*Klumpke's paralysis*) is much less common. In it the lower cords (8th C. and 1st D.) are

affected. The paralysis affects the small muscles of the hands and the flexors of the fingers in the forearm. There is some anæsthesia in the ulnar region. There may also be myosis on the side of the lesion, with a sluggish contraction of the pupil and diminution in the size of the palpebral fissure.

Cases of both types are apt to vary somewhat in the exact distribution of the paralysis, owing to irregular involvement of the cords. Sometimes the paralysis is complicated by separation of the upper epiphysis of the humerus or by fracture of the clavicle or humerus.

The *diagnosis* is generally a matter of no difficulty, provided it is known that the paralysis has existed from birth and that the labour was a difficult one. Should no clinical history be forthcoming, however, the case may be taken for one of anterior poliomyelitis, as the distribution of the weakness and wasting in that disease is occasionally, though not very often, nearly the same.

In the great majority of cases, complete or almost complete recovery of power takes place within two or three months. In many, however, the improvement proceeds more slowly, and yet the child entirely recovers in time.

Nothing in the way of active *treatment* is called for at first. The arm should be wrapped up loosely in cotton-wool and kept quiet and warm. After two or three weeks, gentle passive movements of the limb may be begun, and the child encouraged to move it as much as he will. Massage should also be commenced, and it should be continued as long as any improvement goes on.

In recent years an operation which consists in cutting down on the injured nerve trunks, excising the cicatrised parts and uniting the cut ends, has been strongly recommended by various surgeons (*e.g.* Dr. R. Kennedy [1]).

[1] *Brit. Med. Journ.*, Feb. 7, 1903, p. 298.

Although marked improvement has followed this proceeding in many cases, it is still doubtful whether it can be regarded as justifiable during the early months of life. We certainly see surprising recoveries taking place from time to time without an operation, even after all hope of improvement has seemed small.

CEREBRAL BIRTH PALSIES

Injuries to the brain during labour are more common than lesions of the nerves. In the great majority of cases, the cerebral injury is secondary to a **meningeal hæmorrhage**, which causes pressure and sometimes laceration of the underlying cortex.

The lesion may be due to pressure by the maternal parts on the head, or to that of the forceps and other artificial means used to expedite delivery. According to Dr. Herbert Spencer,[1] "Cerebral hæmorrhage is more frequently found in still-born children delivered by the forceps than in those born by the breech, and in this latter more frequently than in those born naturally by the head." It is much more frequent in first-born than in other children. Of twenty-six cases investigated by Gowers, sixteen occurred in first-born children.

Symptoms.—Children who are the subjects of this lesion are often apparently still-born, and only come round after prolonged artificial respiration. Frequently they have convulsions during the first few days of life. As they get older, it is found that they are paralysed. In well-marked cases a distinct rigidity of the lower limbs may be early noticed, and the arms also are very stiff. The infant has an unnatural difficulty in grasping objects, and if he is able to grasp them, in letting them go. The parents, however, often notice nothing wrong with him until attempts are made to induce him to stand and walk.

[1] "On Visceral Hæmorrhages in Still-Born Children," *Trans. Obstet. Soc. London*, vol. xxxiii., 1891.

In the great majority of cases the paralysis takes the form of spastic diplegia, and affects both sides and both upper and lower limbs, although often one side is more severely affected than the other, or the legs more markedly than the arms. Occasionally the paralysis is unilateral, and sometimes also there is no ascertainable affection of

Fig. 99.—Spastic Diplegia with mental defect from cerebral hæmorrhage at birth. Girl aged 7½ years.

the arms. The whole body is often more or less rigid. The hip joints are extended so that the child cannot sit, and the knees tend to cross one another from adductor spasm (Fig. 99). The knee joints are usually slightly bent and the toes dorsiflexed.

Although the muscles of the limbs feel hard, they are generally small in bulk. Occasionally, however, we find well-

marked true hypertrophy. In a considerable proportion of cases, athetotic or choreic movements develop, especially in the upper limbs. The knee jerks are sometimes got with difficulty, because the extreme muscular rigidity prevents all sudden movement. Often, however, they are much exaggerated. Well-marked ankle clonus is rare. The plantar reflex generally shows a distinct extensor response.

The facial muscles are apt to overact when the child speaks, so that he grimaces in an exaggerated way. In a large proportion of the cases there is strabismus (Fig. 115). The speech is slow of being acquired, and is usually guttural and badly articulated. As the patient gets older his head is noticed to be relatively small, owing to the growth of the damaged brain not keeping pace with that of the rest of the body.

The mental condition of these children varies greatly according to the degree and position of the cerebral injury. In some it is profoundly affected, in others very slightly. As a general rule, however, it will be found that children with spastic diplegia are much more intelligent than their vacant expression and exaggerated facial movements would lead us to suppose (Chap. XIX.).

Diagnosis.—The diagnosis of cerebral birth palsy depends on the history of the early appearance of the symptoms and of a complicated labour. In slight cases when there is no clinical history, there may be considerable difficulty in being sure of the diagnosis. In very early infancy, care must be taken not to mistake an unusual degree of the normal physiological stiffness of limbs for this condition.

Cases of paralysis due to intra-cranial hæmorrhage at birth show little change during the early years of life. It is only when the child is old enough to exert his will strongly in moving his stiff limbs, that improvement may be looked for.

And improvement can never be very great, owing to the permanently spastic condition of the muscles.

Treatment.—When convulsions occur from time to time, sedatives and tonics may prove useful. For the paralysis, however, neither medicine nor electrical treatment is really of any use. Slight improvement follows persevering massage with passive movements and regular exercises. In cases in which the mental faculties are not severely affected, a good deal may sometimes be done by surgical measures to improve the child's condition. If, however, the patient is deficient in intelligence and in will power, the result of any operation is apt to be very disappointing.

Paralyses setting in during Infancy and Childhood

Paralysis arising in childhood may be due to lesions of the nerves, of the spinal cord, or of the brain.

PERIPHERAL PARALYSES

Facial Paralysis.—When facial paralysis sets in apart from an injury, it is due to ear disease in the great majority of cases. Occasionally it is caused by a chill, and sometimes it is a symptom of a cerebral tumour or basal meningitis (especially the tuberculous form).

Peripheral Neuritis.—Severe multiple neuritis of the extremities occasionally occurs as a sequel to various infectious diseases such as influenza, measles, whooping-cough, and enteric fever. It is usually symmetrical in its distribution, affecting both arms, both legs, or all four extremities. It is often, but by no means always, characterised by a degree of sensory as well as by motor paralysis, and there may be tenderness along the course of the affected nerves. There is more or less marked reaction of degeneration, and usually loss of the deep reflexes.

The distal portions of the extremities are generally first and most severely affected. The muscles most markedly paralysed

are usually the extensors of the foot and hand, the peroneal and musculo-spiral being the nerves most liable to be affected.

The treatment consists mainly in keeping the parts warm and improving the general strength by careful feeding, tonics, and especially cod liver oil; and later in massage and exercises. If pain is severe in the early stage, local heat may be applied and sedatives given.

In many cases complete recovery takes place, but in some the limb is crippled by permanent contractures (Fig. 100).

FIG. 100.—Deformity resulting from Peripheral Neuritis, which followed an attack of measles in a boy aged 6 years.

Peripheral neuritis is also met with as a symptom of poisoning by arsenic and lead.

Lead Palsy.—This is not common in children in this country. It is, however, important to bear it in mind when examining cases of obscure paralysis, as it is very apt, when it does occur, to be overlooked.

The onset of the *symptoms* is often gradual and insidious. There may be a history of lead colic. The blue line on the gums is absent in more than half of the cases.[1] The chief

[1] G. Variot, "Intoxication Saturnine," *Grancher et Comby's Traité des Maladies de l'Enfance*, t. I. p. 1008.

peculiarity of lead palsy in childhood is its tendency to affect the lower limbs earlier and more severely than the upper. The usual drop wrist is, however, seen in some cases, but generally later than the affection of the legs. The excitability of the muscles to galvanism and faradism is markedly diminished, but there is no reaction of degeneration. The knee jerks and plantar reflexes are abolished. In some cases the diagnosis may be confirmed by the discovery of lead in the urine.

The *treatment* consists in rest, in encouraging the various excretions, in administering iodide of potash, and in using massage and electricity to the paralysed limbs.

The *prognosis* is generally good.

Diphtheritic Paralysis.—This is a common condition in childhood.

The *symptoms* may set in within a week of the commencement of the throat affection, but generally they do not appear until between the second and fourth week after the disappearance of the false membrane. The part earliest and most frequently affected is the soft palate ; and its implication leads to nasal speech and to the return of fluids through the nose during drinking. Later, the pharynx and œsophagus may also be paralysed, and the child is then unable to swallow. Paralysis of accommodation is often added, so that the patient is unable to read small print or to thread a needle. In some cases a slight squint occurs, leading to double vision. Frequently there is more or less paresis of the lower limbs, less commonly of the upper, and of the muscles of the back and neck. The knee jerks are early lost in most cases, although not in all, and they may not be regained for months.

Paralysis of the heart and of the respiratory muscles is sometimes met with. That of the heart is often unaccompanied by other paralysis, while that of the muscles of respiration is generally preceded by paralysis of the palate

and often accompanied by pharyngeal paralysis. Paralysis of the diaphragm and other respiratory muscles is almost invariably due to diphtheria. In rare cases, however, it is met with without there having been any previous symptom of that disease, and in some at least of these it has followed influenza.

Diphtheritic paralysis may last from six to eight weeks, but always tends to recover. Those cases, however, in which the heart, respiratory muscles, and pharynx are affected are often fatal.

The *treatment* of diphtheritic paralysis consists in the administration of tonics such as iron and digitalis, and especially in the maintenance of the general strength by careful attention to the diet. The child must have complete rest in bed, and a close watch must be kept on the state of the heart. If the power of swallowing begins to be interfered with, recourse must be had at once to forced feeding (p. 585). Many children recover after nasal feeding for weeks who without it would have died in a few days. If the muscles of respiration are affected, strychnine and belladonna are indicated, and special care must be taken to avoid cold, as any affection of the respiratory passages is apt to prove rapidly fatal.

SPINAL PARALYSIS

Paralysis of spinal origin may occur in children, rarely, as the result of tumour, hæmorrhage, transverse or disseminated myelitis, and in cases of Pott's disease it is often due to compression myelitis. Various forms of progressive muscular atrophy, Friedreich's ataxia, and other rare types of paralysis, also develop in childhood. Far the most important disease of the spinal cord, however, that is met with in childhood is poliomyelitis, or infantile spinal paralysis, as it is usually called.

Infantile Spinal Paralysis (*Acute Anterior Poliomyelitis*).—

The *causation* of the acute lesion which gives rise to infantile spinal paralysis and results in destruction of the large ganglion cells of the portion of the anterior horn affected, is still a matter of dispute. The disease is almost certainly due to the action of micro-organisms. Whether there is a specific bacillus, or whether, as Dr. F. E. Batten holds, the lesion is due to thrombosis which may be produced by a variety of different organisms, remains undecided as yet. It occurs most commonly during the second year, but is also frequently met with during the latter half of the first and during the third years; it is much less common after five. It most frequently sets in during the warm months of the year.

The *onset* of the illness generally resembles that of an infectious ailment. In the midst of perfect health the child becomes feverish and drowsy, vomits, and complains of pain and tenderness. The temperature goes up to 101°–103° F., and sometimes there are convulsions. After a day or two, it is found that one or more of the limbs cannot be moved. In other cases the fever is absent, or it is so slight as not to be noticed, and the child, after a somewhat restless night, awakes paralysed in the morning. In others, again, the paralysis sets in immediately after an accident—the child is knocked down by a bicycle or is hit on the head by a stone—and next day a leg or an arm is found to be in a state of flaccid paralysis.

The paralysis of the parts affected is generally complete from the first, or at least within the first twenty-four to forty-eight hours. After remaining about the same for a few weeks, there is generally more or less return of power in some of the muscles, but such spontaneous improvement is said to be limited to the first three months after the onset. Within two months of the beginning of the illness, very marked wasting of the affected limb is seen, associated with lowering of its temperature; and on electrical examination, within a

week, reaction of degeneration may be discovered. In severe cases, the whole of the affected limb, including the bones, ceases to grow at the same rate as the other one.

The *distribution* of the paralysis varies considerably in different cases. Most frequently the disease affects one lower limb only; often both of the lower extremities. Sometimes all the limbs are affected, sometimes one arm and one leg, and sometimes one arm only (Fig. 101). It is rare for the arm and leg of the same side to be affected. Sometimes there is marked implication of the muscles of the back or abdomen. Rarely some of the facial muscles are affected; and, exceptionally, the sphincters of the bladder and bowel may be paralysed. When a number of parts are affected at first, there is generally a rapid improvement or recovery of some of them, but when a single limb is affected, it is exceedingly rare for it to recover entirely. When the sphincters are affected, they generally recover rapidly.

FIG. 101.—Infantile Spinal Paralysis of Right Arm.

The *diagnosis* cannot be made before the paralysis develops. Later, however, the history of the acute onset, the marked loss of power with flaccidity of the muscles, the absence of tendon jerks, and the early wasting, combine to make it very easy in most cases. Sometimes cases of rachitic or scorbutic pseudo-paralysis or of infective epiphysitis or of acute rheumatism are mistaken for infantile

paralysis. Occasionally old-standing cases of infantile spinal paralysis of some of the muscles of the lower limbs show defective movements which are apt to be attributed to congenital malformations or to hip-joint disease. The diagnosis between spinal and cerebral paralysis in childhood will be referred to later.

The *prognosis* in infantile spinal paralysis is always somewhat doubtful at first. In well-marked cases, when a single limb is affected, complete recovery is extremely rare—I have only seen one instance of it. Nearly complete recovery is also very uncommon. Generally, however, there is considerable improvement, and many of the muscles and groups of muscles first paralysed recover. When several limbs are affected at first, one or even two of them may get quite well. The gain in strength may go on for many months and even for years, as the unaffected muscles become hypertrophied so as to be able to take the place of those which have been destroyed.

The prognosis as to probable power of walking must depend, of course, on which groups of muscles are permanently paralysed. If all the muscles affected are on one aspect of the limb, the disability is likely to be much greater than it would have been had opposing groups on the front and back been weakened in a nearly equal degree. When the respiratory muscles are affected to any extent, the outlook is very serious, as the child is likely to be carried off by his first attack of bronchitis—however slight it may be.

The *treatment* of the acute attack must be mainly expectant. The child is to be kept warm in bed and all excitement forbidden. Soothing drugs may be given, but there is no evidence to show that any medicine really affects the morbid process in the cord. After a week or so has passed, gentle manipulation and rubbing may be begun; and, within a fortnight, systematic massage of the affected limbs

should be instituted. This ought to be persisted in for months or even for years; for, when combined with active exercises, it forms by far the most valuable treatment we possess for the results of this disease. The directions to mothers respecting children with paralysed limbs, which are in use at the Hospital for Sick Children, Great Ormond Street, will be found in Appendix C. The child should be encouraged to use his weakened limbs as much as possible, short of tiring himself; and suitable exercises should be planned for him. Alternate hot and cold douches of salt water will be found useful in encouraging the circulation. The limb must also be kept carefully protected from the cold, and specially padded stockings are useful for this purpose.

There is some difference of opinion with regard to the importance of using electricity in these cases. Faradism is certainly of no use to the affected muscles, as they do not react to it. On the other hand, there is good reason to believe that the application of galvanism is sometimes beneficial. It may be begun within a month of the onset of the paralysis. Very weak currents should be used to begin with. In many cases any attempt at electrical treatment gives rise to excitement and screaming. When this is so, it is generally best not to persevere with it, as it may do more harm than good.

This is not the place to deal with the surgical and orthopædic treatment of the deformities due to infantile spinal paralysis. It may be well, however, to refer to the great practical importance of the advances which have recently been made in this matter. While the patient is an infant, care should be taken to lessen such deformities as drop-foot by the use of splints, so that the weakened muscles may not be further damaged by overstretching. When the child is old enough, however, to perform voluntary movements when told to do so, the question of surgical treatment, including

tenotomy, transplantation of tendons, fixation of joints, and even amputation in some bad cases, should be fully considered.[1]

CEREBRAL PARALYSIS

Paralysis from brain lesion is commoner in childhood than that from disease of the spinal cord. It is met with as one of the symptoms of tuberculous meningitis, of tumour, of abscess, and of syphilitic and other diseases of the brain.

Infantile Cerebral Paralysis.—There is a class of cases of permanent paralysis, which, although they may be due to a variety of cerebral lesions, resemble each other closely in their symptoms. As their cause cannot usually be determined during life, these cases are best referred to as infantile cerebral paralysis or as infantile hemiplegia—the paralysis being nearly always unilateral.

According to Osler,[2] "Infantile hemiplegia is commonly the result of a variety of different processes, of which the most important are—

"1. Hæmorrhage occurring during violent convulsions or during a paroxysm of whooping-cough.

"2. Post-febrile processes: (*a*) embolic; (*b*) endo- and peri-arterial changes; and (*c*) encephalitis.

"3. Thrombosis of the cerebral veins."

It seems probable, however, as Strumpell long ago pointed out, that most of the cases of infantile hemiplegia met with are the result of acute polioencephalitis, and that this is practically the same disease as the poliomyelitis which is responsible for infantile spinal paralysis.

The onset of the *symptoms* in these cases is generally sudden, and is usually, although not always, accompanied by convulsions or coma. Often there is considerable rise

[1] See *Modern Methods in the Surgery of Paralyses*, by A. H. Tubby and Robert Jones, London, 1903.

[2] *The Cerebral Palsies of Children*, 1889, p. 96.

of temperature, and occasionally vomiting. Rarely the paralysis is slight at first, and after repeated convulsive attacks becomes more complete; generally, however, it is complete from the beginning. The face is often, but not always, affected.

The arm is generally more completely paralysed than the leg, and the forearm more or less fixed in the prone position (Fig. 102). The muscles are not usually much atrophied, but they are generally in a state of more or less rigid contracture. Rigidity, however, is not quite so prominent a feature in these cases as it is in those of cerebral diplegia. The leg recovers to a greater extent than the arm, and occasionally no trace of the paralysis remains.

FIG. 102.—Infantile Cerebral Paralysis. Boy aged 2½ years.

The deep reflexes are almost invariably increased. Sensation is usually quite unaffected. In a considerable proportion of cases there are choreic or athetotic movements. Aphasia is occasionally found in cases of left as well as of right hemiplegia. Mental defects are common. Epileptiform seizures often occur; they may be of the nature of petit mal, or general convulsions with unconsciousness, but often they consist in unilateral spasms without loss of consciousness. Dr. F. E. Batten[1] has recently given reasons for believing that polioencephalitis may attack many regions of the cerebrum besides the motor area, and may also occur in the cerebellum. It may therefore be responsible for a great variety of symptoms.

[1] *Trans. Med. Soc. Lond.* vol. xxviii.

The *diagnosis* of the lesion in these cases is usually exceedingly difficult at first. It is generally, however, tolerably easy to distinguish between them and cases of infantile spinal paralysis. The main points of difference are given as follows by Sachs:[1]—

Acute Spinal Paralysis	Acute Cerebral Paralysis
Onset sudden, with fever, coma, and convulsions. Convulsions rarely repeated after first few days.	Onset sudden, with fever, coma, and convulsions. Convulsions apt to be repeated.
Paralysis flaccid, associated with atrophy.	Paralysis spastic; no atrophy; associated with rigidity and contractures.
Paralysis widely distributed, possibly involving all extremities, or narrowly limited to one member, or even a single group of muscles.	Paralysis generally hemiplegic, sometimes diplegic or paraplegic; monoplegia rare.
Electrical reactions altered (R. D.).	Electrical reactions normal.
Deep reflexes diminished or lost.	Deep reflexes exaggerated.
Intellect never permanently involved; no epilepsy.	Intellect often involved; epilepsy frequent.

The *prognosis* is almost always unfavourable. In rare cases, especially those due to hæmorrhage (such as occasionally occurs in the course of an attack of purpura), there may be a complete recovery of power. In most cases, however, only slight improvement, if any, is observed. In some cases, even when convulsions have not been present at the onset, the damage to the brain predisposes to their later occurrence; and in cases where the intellect is not seriously affected from the first, there is apt to be a tendency to mental disease in later life.

This form of paralysis, after the first few weeks, should be *treated* by massage and especially by active and passive exercises. If energetically persisted in, these certainly lead to some improvement, but they are much less beneficial in cerebral than in spinal paralysis.

In this class of diseases, as well as in infantile spinal

[1] *The Nervous Diseases of Children*, 1895, p. 305.

paralysis, very great improvement sometimes results from suitable surgical measures.[1]

INTRA-CRANIAL TUMOURS

Far the commonest intra-cranial tumours met with in childhood are caseating tuberculous masses. These may occur at any age and in any situation, and they are not rarely multiple. Most of them produce no symptoms and are only discovered after death. Gliomata are also frequently met with. Other neoplasms are less common, gummata being very rare.

There is a marked difference between the usual position of intra-cranial tumours in children and in adults (James Taylor).[2] In early life the great majority are situated below the tentorium; while after sixteen the conditions are quite reversed, and supra-tentorial are very much commoner than infra-tentorial tumours. This does not apply to latent tuberculous nodules, which are often found in the cerebral cortex in young children.

The **causation** of intra-cranial growths is quite obscure, but there seems no question that in some cases they are to be attributed to an injury. It is extremely rare to find symptoms produced by them within the first three years of life.

Symptoms.—The three cardinal symptoms of intra-cranial tumours—*headache*, *vomiting*, and *optic neuritis*—are generally present. The headache is a fairly constant feature, though it is relatively less severe in children than in adults. Vomiting and optic neuritis are sometimes both absent. The occurrence of general *convulsions* is sometimes the first indication of the presence of a cerebral tumour, and the attacks may go on recurring for a long time without any

[1] See Tubby and Jones, *loc. cit.*

[2] *Nervous Diseases in Childhood and Early Life*, London, 1905, p. 165.

more definite symptom appearing. At various later stages of the disease, also, convulsions are apt to occur. *Nystagmus* is a common symptom, and *giddiness* and *mental dulness* are also common. Secondary *hydrocephalus* often sets in, especially if the tumour is so situated as to obstruct the aqueduct of Sylvius or the fourth ventricle.

In the majority of cases of intra-cranial tumour in children only general symptoms are present, such as the above-mentioned. In many, however, localising symptoms also occur. In young children these are often very difficult to make sure of.

Lesions of the hemispheres are less likely to produce localising symptoms in children than in adults, as Dr. Taylor points out (*loc. cit.*). This is because the functions of the various areas of the cortex are as yet incompletely differentiated, and they are therefore more ready to take up the work of neighbouring parts when these are damaged by disease. One result of this compensatory action of the other cortical areas is that aphasia is almost unknown in children as a symptom of cerebral tumour.

The **prognosis** is extremely bad in almost all cases. The course of the disease varies in different instances. Sometimes in tuberculous and gliomatous tumours it may be very chronic, and temporary arrest of the symptoms—with or without treatment—is not uncommon. Occasionally, cases about the diagnosis of which there seems no doubt entirely recover. In gliomata the symptoms are usually more rapidly progressive and more severe, and hæmorrhages into the substance of the growth are apt to occur; and cases of tuberculous tumour very often end in tuberculous meningitis.

The **diagnosis** depends on the presence of the characteristic symptoms. The mistake most often made by young practitioners is to regard the facial and other paralyses of commencing tuberculous meningitis as localising symptoms of a cerebral tumour.

Treatment.—It is customary in cases of intra-cranial tumour to begin the treatment by the administration of iodide of potash and mercury in full doses. Should the tumour chance to be syphilitic, this treatment will have a great effect. Even when it is not so, however, considerable improvement sometimes follows the use of these drugs.

Another line of treatment which I have once or twice found surprisingly successful consists in the use of very active anti-tubercular measures. If we can succeed in obtaining a rapid and decided gain in weight and vigour in a child with a tuberculous tumour by keeping him in the open air, greatly improving his diet, and administering cod liver oil, the characteristic symptoms may gradually lessen and he may recover almost, if not quite, good health. Unfortunately, it is only rarely that such a result can be obtained.

Removal of the tumour by surgical operation is very rarely possible. In some cases, however, when the pain is severe, trephining may afford marked relief. The headache may also in many cases be greatly diminished by the use of such drugs as antipyrine and phenacetin, and especially by the combinations of these with caffein. Should these fail, full doses of morphine may be tried. Alcohol must be avoided, as it tends to increase the pain.

The same remedies that relieve the headache have sometimes a good effect on the vomiting.

FUNCTIONAL PARALYSIS

The first symptom which is noticed in some cases of chorea is a gradually developed inability to use one arm. This is sometimes mistaken for commencing paralysis from organic disease, but the loss of power is never complete. In some severe cases of chorea also, the paretic element is so much more prominent than the involuntary movements or the inco-ordination, that the patient is apt to be regarded as

suffering from some form of paralysis. Very little care, however, will prevent this mistake.

Hysterical paralysis sometimes occurs even in young children, and it is not uncommon in girls of ten or twelve or older (p. 358).

On Various Forms of Meningitis

The most important forms of meningitis met with in childhood are those due to tuberculosis and to the action of ordinary pyogenic organisms (especially the pneumococcus), the so-called "posterior-basic meningitis," and the acute epidemic cerebro-spinal form of the disease.

TUBERCULOUS MENINGITIS

Tuberculous meningitis is a very common disease of childhood, especially among the lower classes. It is most frequently met with during what we may term the period of dentition (6–24 months). It may occur, however, as early as the third month or even earlier; and it is not uncommon at any later period of childhood.

Very often there is no family history of tuberculous disease, and also no clear indication of where the infection has come from. Not uncommonly, however, we find that a phthisical relative has lived in the same rooms.

The meningeal affection is probably always secondary to cascating tuberculosis elsewhere. This may be in the bronchial or mesenteric glands, in the bones or joints, the lungs, the brain, or the ear. But, during life, there is very often no indication as to where the original focus lies. In some cases there is an account of a head injury. In a large proportion of the cases there is a history of the child's resisting power having been recently lowered by an attack of measles or whooping-cough.

Symptoms.—Children who have been debilitated by gross

tuberculous lesions are liable to be suddenly attacked by severe symptoms of tuberculous meningitis. The patient, who has been in his usual languid state of health, suddenly develops paralysis of one or more limbs or of the face or ocular muscles, and soon after has a convulsion or becomes very drowsy. Such cases generally have a rapidly fatal course.

In the great majority of cases, however, the initial lesion is one which has not hitherto materially affected the child's general health. When this is so, the onset of the brain symptoms is generally very insidious.

In a typical case, the onset of characteristic symptoms is preceded by a *premonitory stage*, which may last for two or three weeks, or even for two or three months. During this period the child is vaguely out of sorts. He is languid and irritable during the day, and restless and wakeful at nights. He loses appetite and weight, and sometimes vomits with no apparent cause. He is constipated, has occasional rises of temperature, is drowsy at times, and sometimes flushes and complains of headache. Occasionally incontinence of urine or fæces may begin. The pulse may be slow and irregular. If he is old enough to be speaking, he will probably stop talking. In many ways his mother finds him becoming changed and unlike himself in disposition.

At this period, while it is obvious that the child is far from well, there are usually no symptoms present which might not be attributed to dyspeptic derangement in a teething baby. In older children and adolescents the early symptoms of tuberculous meningitis may very closely resemble those of hysteria.

Sooner or later the disease shows itself more distinctly by the marked aggravation of some of the already existing equivocal symptoms and the occurrence of others of a more definitely cerebral character. The *period of invasion* may now be held to have begun. It is customary to divide this

period into three not very well defined stages. The first is one of *irritation*, and corresponds to the implication of the meninges and cortex. The second is that of *pressure*, during the accumulation of fluid in the ventricles. The last is one of *relaxation* and paralysis, and indicates the involvement of the medulla.

Tuberculous meningitis is such a treacherous disease, that we can hardly speak of any group of its symptoms as pathognomonic. The most characteristic combination, however, is that of *vomiting*, *headache*, and *drowsiness* with *constipation*. This should always arouse suspicion, and the onset of *convulsions* in addition may be held as strongly confirmatory.

Early in this stage the peculiar *facies* which has been already described (p. 11, Figs. 4, 6, and 7) generally develops; the cheeks are flushed, and the tache cérébrale is usually present. The patient tends to lie constantly on his side with the limbs fully flexed. He is very irritable, and resents being disturbed. If the bed clothes are pulled off, he clutches at them and draws them back and screams irritably (*Stocker's sign*). He may show marked *photophobia*, but this is not so common a symptom in children as in adults. Occasionally the child may utter a sudden sharp scream, the so-called *hydrocephalic cry*. Far too much prominence has been given to this symptom, which is not an important one and occurs only in a small minority of the cases. A piercing scream is much more characteristic of acute ear disease than of meningitis.

The *headache* is sometimes very severe, and a bad headache in a young child is always an ominous symptom, as it is rarely in them due to functional disease. Occasionally severe pain is complained of in some other part of the body. If the *drowsiness* is marked, it also is very significant, provided the action of alcohol and other sedatives can be excluded. *Vomiting* is almost invariably present at some period of the case. It may last long, but sometimes it only occurs two

or three times at the beginning. *Constipation* is also a pretty constant symptom; rarely there is diarrhœa. Unless abdominal tuberculosis is present, there is usually, though not always, marked *retraction of the abdomen* (Fig. 103).

At first the *pulse* may be regular and simply accelerated, but soon it develops the peculiar characters already described (p. 236). The *respiration* early becomes irregular, and frequent deep sighing is very characteristic. The fontanelle is tense and pulsating; the neck stiff at times and occasionally distinctly retracted. *Head retraction*, however, is rarely very

FIG. 103.—Tuberculous Meningitis. Retracted Abdomen.

marked in this form of meningitis, nor is it often continued for any length of time.

Convulsions in an early stage are less characteristic of this than of some other forms of meningitis, but they are not uncommon, and they may occur at any period of the disease. They may be followed by paralysis of limbs and by rigidity. The pupils are usually contracted and sometimes oscillate, and there are often irregular nystagmoid movements of the eyeballs. Various degrees of *squinting* are very common, and ptosis is also often met with. The *temperature* is irregular, though rarely very high, in most cases. Occasionally it remains

normal or subnormal throughout. The blood often shows a very considerable *leucocytosis*—much greater than in other forms of tuberculous disease. On *lumbar puncture*, the fluid generally spurts out. It is clear and colourless, in most cases, when it is drawn off, though it often shows a slight deposit on standing. The leucocytes in this are found to be mainly lymphocytes. Tubercle bacilli are only rarely demonstrated in it unless very special precautions are taken.

In the *second or pressure stage* of the illness, the drowsiness is the most marked feature. The vomiting usually ceases, the pulse gets more markedly irregular and slow, various local paralyses may occur, and quasi-purposive movements of the face, lips, jaws, and hands are common. Grinding of the teeth is frequently heard in older children. The urine and fæces often pass involuntarily. Cheyne-Stokes respiration may develop, and local or general convulsions may occur.

Finally, the *stage of paralysis and coma* supervenes. In it the child lies on his back, more or less entirely unconscious, with his limbs extended and his hands often crossing one another over the pubes. The pupils are widely dilated, the conjunctivæ insensitive and often covered with shreds of muco-pus. Very often a degree of optic neuritis is present, and sometimes choroidal tubercles are found ; but these are more characteristic of general tuberculosis. During this stage the bulging fontanelle often becomes flattened, the pulse becomes regular, very rapid, and weak, the respiration shallow and quick, and the temperature shows irregular rises. Swallowing becomes increasingly difficult.

The final stage is often painfully prolonged, and may go on for many days. Sometimes there is apparent improvement for a day or two before the end.

The **duration** of the illness varies considerably in different cases. In cachectic children, as already mentioned, death may occur within a few days, and generally within a

week. In ordinarily vigorous infants, the symptoms may be expected to last about three weeks before death occurs. Some cases go on much longer, however, when carefully nursed, and Barlow mentions one which lasted for sixty-three days.

Diagnosis.—Owing to the number of its symptoms and their indefinite character, tuberculous meningitis is very apt to be mistaken for various other conditions at different stages of its course.

Dyspeptic vomiting, especially in teething children, is one of the diseases which most often gives rise to difficulty. And often its symptoms are so like those of early tuberculous meningitis that the diagnosis is impossible in the early stages. In judging between the two conditions, we should estimate carefully the other symptoms of digestive disturbance and the state of the gums. We should also look out for retraction of the abdomen, slowness and irregularity of the pulse, and a sluggish condition of the pupils. The occurrence of convulsions would be in favour of meningitis, although it might also occur in the other disease. A dose of castor oil will sometimes clear up very perplexing symptoms in a dyspeptic and teething child.

In the rare cases in which *cyclic vomiting* begins in young infants, it may simulate tuberculous meningitis to a considerable extent: as may some cases of *gastric influenza* and also the onset of various of the *exanthemata* in nervous children.

Cases of *typhoid fever* occasionally resemble tuberculous meningitis very closely. In considering the differential diagnosis, we must note the temperature, which is usually higher in typhoid, and the pulse, which is quicker and more regular. The typhoid patient tends to lie on his back, is not irritable, and does not show Stocker's sign. He also shows no cervical rigidity, and his abdomen is more or less

full instead of being retracted. After the eighth day spots may be found, and Widal's test will generally decide the matter.

Acute pneumonia, especially when it affected the apex, has often given rise to mistakes. The rapid onset with high fever, the pneumonic facies (p. 10), the regular pulse, and the early appearance of rapid respiration, should enable the diagnosis to be readily made by any one who remembers the occurrence of "cerebral pneumonia." A high degree of leucocytosis would be in favour of pneumonia.

Acute middle-ear disease is another condition which simulates meningitis. It gives rise to irregular pyrexia, irritability, drowsiness, screaming, vomiting, some bulging of the fontanelle and stiffness of the neck, and to convulsions. The temperature is generally higher and more continuous than in tuberculous meningitis, the abdomen is not retracted, and there is deafness. An examination of the tympana or the appearance of discharge from the meatus would settle the question.

Uræmia in young children occasionally presents symptoms very difficult to distinguish from those of tuberculous meningitis. The history of the onset and the condition of the urine should suffice for the diagnosis.

Cases of *spurious hydrocephalus* are to be distinguished by the history of recent severe diarrhœa and by the presence of a depressed fontanelle, and frequently by a distended abdomen.

The diagnosis between tuberculous meningitis and *intracranial tumour* has been already referred to. We must always bear in mind the extreme rarity of symptoms from the latter in children under four.

The distinction between tuberculous and other forms of meningitis will be dealt with later.

Treatment.—When tuberculous meningitis is really

present, treatment is probably never of any use. It is almost always well, however, to order some treatment, partly for the parents' sake and partly because we can rarely be absolutely certain that our diagnosis is correct. There are probably few practitioners of many years' standing who cannot recall instances of children whom they believed, without doubt, to be dying of this disease and who yet made a complete recovery.

The favourite remedy to administer in these cases is mercury, and it may be prescribed internally, in the form of liq. hydrarg. perchlor. (♏i) or as calomel (which has the further advantage of counteracting the constipation), or it may be applied externally as mercurial ointment. Small doses of pot. iodid. may also be given, or iodoform ointment (10 per cent.) may be applied to the head.

When severe headache is present, one or two leeches to the temple may give relief; and chloral may be given if convulsions set in. Forced feeding and nutrient enemata are sometimes called for. Surgical treatment has been attempted from time to time, but it cannot be said to have been proved to be of value. Lumbar puncture certainly gives temporary relief in a few cases. In the great majority, however, it has no effect at all.

ACUTE SUPPURATIVE MENINGITIS

Acute purulent meningitis is not uncommon, especially in early infancy. It may be due to injury or to the spread of inflammation from neighbouring parts, as in the case of suppurating sores, disease of the petrous bone, erysipelas, etc. In the great majority of cases, however, it is caused by the pneumococcus. When this is so, the meningitis may be secondary to pneumonia or empyema; but this is by no means always the case. The distribution of the lesion varies in different cases, but generally the vertex is severely affected.

Symptoms.—The course of the disease is very acute in most cases. It is generally fatal within a few days, or, at most, within a week. Occasionally, however, especially in older children, it may last much longer, and it may be entirely recovered from.

The onset is sudden, with high fever, vomiting, headache, delirium, and giddiness, and there are generally convulsions. The fontanelle bulges, there is usually head retraction with general rigidity and tenderness, and often strabismus and nystagmoid movements of the eyes. Coma supervenes early, and there is often hyperpyrexia (107° to 108°) before death. There is a marked degree of leucocytosis.

In cases where the vertex is the part chiefly affected, the symptoms are often extremely obscure; and without lumbar puncture the diagnosis may be impossible. In such cases it may be difficult to make sure of any head retraction, and the pyrexia, vomiting, stupor, etc., may be such as might accompany any high fever.

The disease which is most likely to be mistaken for purulent meningitis is acute otitis.

Treatment.—Should any primary source of suppuration be discoverable, it should, of course, be dealt with at once. In strong children, when the distress is great the application of one or two leeches behind the ears in the early stages may cause considerable relief. Generally, we apply an ice bag to the head, and give bromide and chloral or inhalations of chloroform when convulsions threaten. Prolonged hot baths (95° to 100° F.) are also useful. Mercurial inunction seems sometimes beneficial. Lumbar puncture occasionally lessens the pain obviously, and if so, may be repeated with benefit. In cases which survive the first week or so, the treatment is the same as that for posterior basic meningitis.

POSTERIOR BASIC MENINGITIS

This is the name usually now given to a form of non-tuberculous lepto-meningitis, which begins at the posterior part of the base of the brain and is due to a special diplococcus. This organism, which grows readily on agar and is stained by methylene blue but not by Gram's method, was first established as the cause of the disease by Dr. G. F. Still.[1] It is now regarded as a form of the diplococcus intra-cellularis meningitidis of Weichselbaum which is responsible for epidemic cerebro-spinal meningitis. The mode of infection is still obscure.

The large majority of cases occur in children under a year old, and the commonest age is between the third and sixth month. The disease is rare after the third year. The cases occur sporadically, but here, as well as in London, for some unknown reason, more are met with during the first four than during the other eight months of the year.

The disease usually affects strong, healthy children—not very rarely breast-fed babies. In a considerable proportion of cases, however, there is a history of antecedent catarrh of the nose, bronchi, or intestines.

Symptoms.—The three cardinal symptoms of the early stage are *head retraction*, *vomiting*, and *convulsions*. Any of the three may come first, and the other two generally follow within a day or two. The child seems anxious and ill at ease, and his fontanelle bulges. Sometimes he has a prolonged attack of screaming. The head retraction is usually very marked, and it is the most characteristic symptom. When once it sets in, it may vary in degree, but it usually lasts till death, or at least till shortly before it. In cases which recover, the head retraction persists for

[1] *Journ. of Path. and Bacteriol.*, May 1898, p. 147.

many weeks. *Tonic spasm* of the whole body generally occurs sooner or later. In its most severe and characteristic form it gives rise to extreme opisthotonos (Fig. 104). The upper extremities are often strongly adducted, with the elbows fully extended, the wrists and fingers flexed, and the forearms extremely pronated. The lower limbs are also adducted and fully extended at the hips, knees, and ankles; the toes are usually flexed on the sole, but may

Fig. 104.—Posterior Basic Meningitis. Extreme Opisthotonos.

be dorsiflexed. At an earlier stage all the limbs may be in a state of flexion. Kernig's symptom is generally well marked.

The vomiting is usually most severe at first, but it may recur from time to time during the illness. The convulsions are also mainly an early symptom. Constipation is rarely marked, and frequently there is some diarrhœa. The eyes have often a peculiar staring look; but, in the early stages at least, there is a marked absence of the cerebral facies

which is so characteristic of tuberculous meningitis (p. 10) There is often, also, a complete absence of drowsiness. Nystagmus and strabismus are commonly observed. Although optic neuritis is rare in this form of meningitis, temporary amaurosis with normal optic discs often occurs and sometimes lasts for months in cases which ultimately recover completely. Deafness is also sometimes met with.

The pulse is generally rapid and quite regular. The temperature varies. It may be fairly high at first, but often it is not much raised. There is usually a slight degree of leucocytosis, 18,000 to 20,000. No abdominal retraction is present, or very little; and local paralyses are very rare. Occasionally there is a slight joint affection or a swelling of one of the tendon sheathes. An extreme degree of emaciation is very characteristic of the later stages.

A common sequel to the disease is hydrocephalus. Sometimes its clinical manifestations are few and indefinite. Usually it shows itself by bulging of the anterior fontanelle and slow growth of the head in size and weight. The sutures may separate and the lateral and posterior fontanelles gradually reappear. Sometimes marked craniotabes develops. Generally the axis of the eyes changes so that the sclerotic is abnormally visible above the iris (Fig. 105).

Duration.—Those cases which end fatally usually last some six or seven weeks. Sometimes the duration is only three weeks, and in other cases it is three months or more. When recovery takes place, the improvement is generally very slow.

Prognosis.—Posterior basic meningitis is the least fatal form of the disease. About one-third of the cases (sixteen out of forty-one of my cases) recover from the actual illness. This does not, however, accurately represent the amount of

harm done, for many of the recoveries are incomplete and only temporary. The blindness, above referred to, generally completely passes off in time. The deafness which occurs in a few cases is, however, often permanent. The most serious lesion that may be left is chronic hydrocephalus. This not very rarely gives rise to sudden death, some months or even years after the patient has been supposed to have recovered.

Fig. 105.—Posterior Basic Meningitis, showing downward direction of eyeballs.

It also leads to mental defect in a considerable proportion of the cases.

Diagnosis.—The early onset of marked and continuous head retraction is the most distinctive symptom in these cases, and whenever present should suggest the probability of the case being one of this disease. In cases of suppurative meningitis the symptoms are generally much more severe and the course very much shorter. The

chief points of difference between this disease and tuberculous meningitis may be summed up as follows:—

	Tuberculous.	Posterior Basic.
Age	Commonest during second year or later	Commonest during first year; rare after second
Onset	Insidious, after premonitory wasting and irritability	Sudden, during health, often with symptoms of catarrh
Facies	Cerebral facies marked early	Late of developing
Irritability	Great	Not so marked
Head retraction	If present, slight and intermittent	Marked, continuous, and early
Nystagmus	Rare	Common
Optic neuritis	Common	Rare
Local paralyses	Common	Very rare
Persistent tonic spasm	Rarely marked	Generally marked
Slow, irregular pulse	Generally present	Very rare
Constipation	Marked	Often absent, often diarrhœa
Abdominal retraction	Usually great	Never marked
Average duration	About three weeks	About six or seven weeks
Fluid from lumbar puncture	Clear; lymphocytosis. Occasionally tubercle bacilli	More or less turbid; polymorpho-nuclear leucocytosis, usually diplococci

Treatment.—The most important part of the treatment in most cases consists in close attention to the child's digestion and general nutrition, as debility, dyspepsia, and diarrhœa are often the main causes of death. It is also of great consequence that his feeding should be very carefully managed, because there is considerable risk of inhalation pneumonia being set up when there is head retraction and rigidity.

Certain drugs have seemed useful and should always be given, especially in the early stages, when this can be done without upsetting the digestion. The most important are pot. iodid. (grs. i to ii every two or four hours) and hydrarg. c̄ cret. (gr. i twice or thrice daily). The external application of

iodoform ointment (10 per cent.) or of mercurial ointment to the scalp seems sometimes beneficial. Occasionally, especially in pyrexial cases, lumbar puncture is followed by marked improvement, and if so, it should be repeated at intervals. Generally, however, in the later stages it has no effect at all.

EPIDEMIC CEREBRO-SPINAL MENINGITIS

Acute meningococcal meningitis has, till lately, been rarely seen in this country as an epidemic. Recently, however, outbreaks have occurred in Belfast, Glasgow, Edinburgh,[1] and other places. Although it appears in epidemics, there seems to be little evidence forthcoming that it is infectious in the ordinary sense; and it is comparatively rare to find more than one case in a family. The majority of the patients are children; but older children are quite as often attacked as babies.

Although none of the clinical features can be said to be essentially different in nature from those which characterise posterior basic meningitis, in the epidemic type they are generally so much more acute and intense in degree that the clinical picture is very different. Even in the worst epidemics, however, there is a certain proportion of relatively mild subacute cases, and these are often indistinguishable from the ordinary posterior basic type.

Symptoms.—The patient has usually, hitherto, been a strong, healthy child, and the onset is almost always very sudden. There is high fever, usually severe headache, and often pains also in the nape of the neck, the back, sides, and elsewhere. Vomiting almost always occurs, often there is delirium, and sometimes convulsions. The child looks and evidently feels very ill in most cases. Quite often difficulty

[1] J. S. Fowler, *Review of Neurology and Psychiatry*, April 1907, p. 249; John Thomson and Stuart M'Donald, *Scot. Med. and Surg. Journ.*, March 1907, p. 205.

of breathing is complained of, and there is an increased rate of respiration.

Probably the most important and distinctive symptom is cervical rigidity. It is only rarely quite absent, although often at first it is not severe in degree. It is generally accompanied by severe pain on the slightest attempt to bend the head forward. More or less marked head retraction soon sets in (Fig. 106), and in the later stages the whole body is stiff and the most extreme opisthotonos is common (Fig. 107).

Kernig's symptom is very often, but not always, present. In the early stages the abdominal reflexes are quite abolished

Fig. 106.—Epidemic Cerebro-Spinal Meningitis. (Dr. J. S. Fowler's case.)

(Fowler); but they return as the acute symptoms subside. Generally the patients are markedly hyperæsthetic and very irritable if disturbed. So long as they are left alone, however, they are usually apathetic and show no signs of suffering. In the less acute cases the child's consciousness is often strangely little affected.

Various rashes are met with. Herpes on the lips, like that in pneumonia, is occasionally present, and occasionally a mottled erythematous rash appears on the trunk and limbs. The most characteristic skin lesion, however, is the purpuric eruption from which the popular term "spotted fever" is

derived. This rash was only seen in a small minority of the cases in the recent Edinburgh epidemic. Its presence is of bad omen and usually indicates a severe type of the disease. The temperature curve is very irregular.

In a few cases enlargements of the larger joints and swellings in the subcutaneous tissues of the limbs are seen. Examination of the blood shows marked leucocytosis. Deafness is common and is apt to be permanent. Amaurosis, usually temporary, is often found at some stage of the case.

Lumbar puncture is of the greatest importance in diag-

Fig. 107.—Epidemic Cerebro-Spinal Meningitis. (Dr. J. S. Fowler's case.)

nosis, and should always be performed, as it is sometimes only by its means that we can distinguish between this disease and some other forms of meningitis. In the very acute cases the cerebro-spinal fluid is markedly turbid. In the less acute it sometimes has the appearance of pure pus and sometimes is nearly quite clear and watery. The meningococci are generally easily found, being in large numbers, both in the cells and in the surrounding fluid.

In some cases of epidemic cerebro-spinal meningitis the disease sets in with severe diarrhœa and vomiting; and it is important to remember that several instances have been

observed in which one child in a family has died of exceedingly acute gastro-enteritis with a purpuric rash, but with no meningitis, while another has, soon after, taken a typical attack of acute meningococcal meningitis.

In the most acute, or "fulminant," cases, which are generally fatal in a few hours or days, the diagnosis may be very difficult until lumbar puncture is done, because the severe general toxic symptoms more or less completely mask the special features of meningeal disease.

The **treatment** consists, firstly, in very careful attention to the nutrition and general strength. Hot baths are very soothing, and are useful because they relieve the child's distress and so tend to save his strength. For the same reason, morphine is sometimes beneficial. Iodides, ergot, and other drugs are perhaps of value in the less acute cases. Lumbar puncture sometimes causes obvious relief, and when it does so it should be repeated at short intervals. It rarely, however, influences the course of the disease to any marked degree. Subcutaneous saline injections have sometimes seemed to do good. None of the sera at present on the market have proved of any great value. In Belfast [1] and Edinburgh striking benefit has, however, resulted recently from the injection into the spinal canal of a serum prepared and privately supplied by Dr. S. Flexner of New York.

The effect of treatment is very disappointing, and the mortality is always high. In the recent Edinburgh epidemic (spring 1907) it was nearly 80 per cent.

[1] Robb, *Brit. Med. Journ.*, Feb. 15, 1908, p. 382.

CHAPTER XIX

ON MENTAL DEFECT—AMENTIA[1]

(*Idiocy, Imbecility*)

LIKE "paralysis" and "fever," the words "mental defect" and "idiocy" do not, properly speaking, designate a disease, but only a symptom which is present in many diseases. It is, however, from its nature, such an overwhelmingly important symptom that it overshadows all the other signs of disease that are present. We are in the habit, therefore, of classing the subjects of this symptom together in our minds simply as idiots or imbeciles irrespective of the exact nature of the brain lesions which have made them so.

Idiocy is defined by Dr. Ireland as "mental deficiency or extreme stupidity, depending upon malnutrition or disease of the nervous centres, occurring either before birth or before the evolution of the mental faculties in childhood;" while the term imbecility merely signifies a lesser degree of the same condition. These two words have naturally very unpleasant associations connected with them, and should never be mentioned in the hearing of the child's parents or friends. Feeble-mindedness and mental deficiency are comparatively inoffensive terms, and may be used to designate any degree of mental impairment from the slightest to the

[1] W. W. Ireland, *Mental Affections of Children*, London, 1898; G. E. Shuttleworth, *Mentally Deficient Children*, 2nd ed. London, 1900; Martin W. Barr, *Mental Defectives*, Philadelphia, 1904; A. F. Tredgold, "Amentia," Mott's *Archives of Neurology*, vol. ii. 1903, p. 328, and *Practitioner*, Sept. 1903, p. 354.

most severe. Recently, Dr. Tredgold has done good service, by introducing as a purely technical term the word "Amentia," which serves to describe all degrees of imperfect or arrested mental development, and has no unpleasant associations for the lay mind.

Classification.—Dr. Tredgold divides all cases of mental defect into two classes according as they are *primary* (*i.e.* due to "an inherent incapacity for perfect development, owing to defects within the embryonic rudiment") or *secondary* (*i.e.* due to "the mental development having been arrested by some extraneous or accidental cause"). The first of these groups is said to include about 90 per cent. and the second about 10 per cent. of all the cases. This statement refers to older children. When the cases are seen in infancy, the proportions of the different varieties is somewhat different.

The main headings of his classification may be given as follows:—

- Primary Amentia
  1. Simple.
  2. Microcephalic.
  3. Mongolian.
  4. Hydrocephalic.
  5. Sclerotic.
- Secondary Amentia due to
  - *A*
    1. Epilepsy.
    2. Encephalitis.
    3. Hydrocephalus.
    4. Trauma.
    5. Infantile cerebral degeneration (amaurotic family idiocy).
    6. Juvenile general paralysis and other forms of dementia due to congenital syphilis.
  - *B*
    7. Athyroidism (cretinism).
    8. Sense deprivation (such as occurs in children who are both blind and deaf, unless they have obtained special instruction).

Complicated cases, which seem to belong to several of these types, are not uncommon.

All the forms of disease which damage a child's mental powers and give rise to idiocy also lessen his power of

resistance to disease and death; hence a large majority of idiots die within a few years of birth. We see, therefore, many more infants than older children affected in this way, and many more children than adult patients.

Before considering briefly the more important of the different types of mental defect, we shall deal with the diagnosis and treatment of the condition in general.

The Diagnosis of Amentia.—The symptoms by which we recognise the presence of mental defect in infants and in young children are largely bodily as well as mental. They may be divided into four groups, summarised as follows:—

1. Some children present from birth or early infancy such *an abnormality of bodily conformation* as proves them to be subjects of a disease of which mental defect is a cardinal symptom. Thus, the diagnosis that the child is suffering from cretinism, mongolism, or microcephalus, or from a severe degree of chronic hydrocephalus or spastic diplegia, implies a diagnosis of mental deficiency. In these cases the opinion that an infant is an imbecile can therefore often be confidently formed long before he is capable of showing mental peculiarities, and some idea of the degree of his probable improvement may sometimes also be possible.

There are a series of *minor bodily malformations*[1] on which much has been written in recent years as indicating a tendency to mental defect. Such are abnormally vaulted and cleft palates, hare-lips, defects of the rim of the ear, differences in shape of the two ears, marked epicanthic folds at the inner corner of the eyes, spina bifida occulta, congenital malformations of the heart, and many others.

With reference to this class of malformations, Dr. Warner[2] gives what he calls the *law of coincident development*. This is to the effect that "when any part or parts of the body

[1] See *The Study of Children*, by Dr. F. Warner, London, 1897.
[2] *The Children. How to Study Them*, London, 1887, p. 11.

present signs of defective development, the brain is very apt to be defective likewise." All these defects may be met with in children of excellent intelligence, but they are more common in the mentally defective. The fact of their presence may sometimes constitute slight confirmatory evidence of imbecility, but alone it can never be of much importance. Dr. Langdon Down[1] thought that the presence of bodily defects in idiocy indicated that the cases possessing them were of congenital rather than of acquired origin; but this rule is one to which there are many exceptions.

2. The *periodic occurrence of convulsions* is often associated with the presence of mental impairment. This may be the result of the fits, but more frequently it is merely another manifestation of the organic brain disease or defect which is causing them. All imbeciles are liable to suffer from fits. These may be of the regular epileptiform type; but often, in young infants especially, they consist, to begin with, merely in a sudden start, the head, arms, and legs being momentarily jerked forwards. With these slight attacks there is a temporary loss of consciousness, and there may also be a little stertorous breathing; after them the child usually cries as if he were distressed.

3. The abnormal state of the child's intellect is often most plainly betrayed by *gestures and actions which are altogether abnormal*, showing that the mind, as Dr. West puts it, is not only dwarfed but deformed. Thus, in young babies we may have abnormal fretfulness with constant causeless crying. I have known several such infants who were dosed for weeks by myself or others, and not a few who were circumcised, under the impression that they were suffering from bodily pain, before the real cause of their crying was discovered. Again, there may be gaping movements of the jaw or a constant restless rolling of the eyes, the baby never

[1] *Mental Affections of Childhood and Youth*, 1887.

looking straight at anything as a healthy child should do. Sometimes there is unmeaning laughter with exaggerated gestures, wayward and impulsive actions, or perhaps dirty and disgusting ways of eating. Constant dribbling of the saliva is another very common symptom. Often we find utter apathy, with absence of the natural reflex muscular movements, so that the baby feels like an inanimate object in his nurse's arms when she tosses him up and down, instead of making springing movements with the limbs in his enjoyment of the motion, as a normal infant should do.

4. The above-mentioned grosser indications of intellectual defect may be absent, and the diagnosis may have to be founded on the degree of *delay in the development of the bodily and mental powers* that is present, taken along with the surrounding circumstances. Thus, we must think of mental defect whenever an infant is very long in learning to hold up his head, to sit, to use his hands, to stand and to walk, and especially if he does not show the natural desire of the healthy child to exercise all his developing motor faculties. Or again, though his eyes are normal, he does not seem to notice things, and is backward in responding to the touch, the smile, or the voice of his mother or nurse, and at a later stage backward in speaking. Undue delay in acquiring the usual degree of control over the action of the bladder and bowel is another circumstance which may arouse suspicion as to the state of the intellect. Occasionally the earliest abnormality noticed in a mentally defective baby is unwillingness to suck.

Backwardness in the acquisition of these natural actions and gifts may of course be due merely to temporary debility accompanying or following bodily illness, and this is often the case. If, however, the degree to which it is present is marked, and the child shows no sign of debility to account

for his backwardness, we will probably be right in attributing it to mental defect.

Treatment.—With regard to the treatment of mentally deficient children, two general statements may be made—

1. In the vast majority the condition is, strictly speaking, incurable, in the sense that children who are mentally weak to begin with will remain so to the end, whatever is done.

2. There are few mentally deficient children, however, who are not capable of great improvement under suitable treatment.

These two statements are equally true, but the latter is much the more important as a basis of action.

The presence of a mentally defective child in a family is always, sooner or later, the cause of much distress. It is the duty of the medical man to do what he can to lessen this; and it is always to be borne in mind that the treatment must include not only the child who is causing the suffering, but also the parents who are feeling it.

When a baby is mentally defective, and his parents do not know it, the first question that arises is: Are we to tell them? If they ask plainly, they must, of course, be told the truth. If, however, as often happens, they ask no direct questions (either from ignorance or because they are afraid of the answer), it is usually far better to tell them nothing. There are two reasons for this. (1) A very large proportion of imbecile babies die early. When this happens, it is clearly well for all concerned when the child's defect has remained a secret known only to the doctor. (2) The parents often know nothing about the subject of mental defect. When this is so, a sudden intimation that it is present in their child, if made before their own observation has prepared them to receive it, is apt to produce unsatisfactory results. They either refuse to accept it, or, if they do so, it causes such

discouragement as to paralyse their efforts for his improvement.

Whether the parents realise the significance of their child's backwardness or not, the main thing is that they should turn their attention actively to what can be done to improve him.[1] It is by trying to make him do things better that they will come to see the true state of the case. They should, however, be told plainly that the expectation of sudden unworked-for recovery at seven, or fourteen, or any other age, is an utter delusion.

The extent to which mentally defective children benefit from treatment, and the best treatment to employ, vary, of course, greatly, according to the degree of the defect and the nature of the case. In many forms of the condition the improvement under bodily and mental culture is remarkable. In the lowest type of idiocy no treatment, beyond general mothering, may be possible. And there are cases, *e.g.* of epileptic and syphilitic dementia, in which any attempt to train the mind will only aggravate the child's condition.

The object of our treatment, so far as the child is concerned, is to make him as happy and as good as possible. As his happiness will largely depend on how many things he can and does do and notice, and on how he commends himself to others by his behaviour, our chief aim must be to make him more capable and likeable. We must also try to give him some sense of duty proportionate to his intellect, and to show him that his duty lies in doing things that he is quite able to do.

What follows refers chiefly to young children (under five or six years). It is mainly at first that the mothers require assistance; and the treatment cannot be begun too early.

[1] It is sometimes an advantage to give to the parents a few simple directions in a printed form. An example of such directions will be found in Appendix D.

The main indications for treatment may be stated as follows:—

1. *Attend to the General Health.*—This includes the giving of good plain food suited to the child's powers of mastication, attention to the bowels, much open-air exercise, frequent baths, and especially warm clothing, for the child will always be duller if he is feeling cold.

If epilepsy or cretinism be present, their treatment is, of course, to be seen to. It is also important to treat such conditions as rickets, anæmia, tubercle, and dyspepsia, which may greatly interfere with the child's mental as well as with his bodily vigour. Local defects, such as refractive errors, adenoids, and contracted tendons, are often well worth attending to in these children; and massage and electricity are sometimes useful. Craniectomy has proved of no value, and whether surgical operations for chronic hydrocephalus are ever of benefit to the intellect, is not yet quite settled.

2. *Awaken the Child's Faculties,* (*a*) *Bodily and* (*b*) *Mental.*

(*a*) He must be encouraged in the *voluntary use of all his muscles* regularly and carefully. Such exercises are not only good for improving his strength and co-ordination, but are also helpful in stopping the purposeless automatic movements which so many of these children have. Musical drill, dumb-bells, ball games, bean-bags, walking between the steps of a ladder, nail-boards, threading beads, and all sorts of kindergarten occupations, are useful for the older and more intelligent of the children, as well as singing and reciting. For young children and those who are less capable, various very simple actions, such as clapping hands or playing with a rattle, may to some extent answer the same purpose. It is important to teach the child chewing if possible; and if he dribbles, his lips may be strengthened by exercises, such

as holding a pencil transversely between them for a given time, and by blowing whistles, trumpets, etc.

(*b*) Teach him *to notice things* and to compare their characters—roughness and smoothness; hardness and softness; heaviness and lightness; heat and cold; colours; shapes (circles, squares, triangles, spheres, cubes, cylinders, etc.); distances; sounds (musical and other); tastes and smells. Take him out or to the window, and let him see the people, horses, dogs, cars, etc. If objects do not attract him, perhaps bright light and colours will. Find out what arouses his attention, and let him have it. Encourage him to look at, listen to, and handle anything that he is taken up with. Any sort of interest will help to brighten him.

3. *Encourage him to use his Awakened Faculties in giving himself Pleasure.*—Remember that he needs to be taught to do many things which normal children do of their own accord without teaching. Incite him to try to do things; and, at first, plan easy successes for him. If he deliberately wants a thing, tries to get it, and succeeds, this is a most valuable and a very pleasant lesson for him. In the case of a baby, if he likes a noise, give him a key and a pot lid and let him make it for himself. Never let the mother or nurse go on doing for the child anything that he can be made to do for himself. For most mentally defective children, mere memory knowledge is of little use, but the more things they can do the better for them.

4. *Promote Self-Control.*—This is of immense importance and very difficult. It includes a number of things. There is, firstly, keeping himself clean and letting his mother know when he requires to be attended to. Some mentally defective children cannot be taught cleanly habits at all. A great many, however, who seem to have complete incontinence in early childhood, may, with persevering training, become quite normal in this respect in time. General personal cleanliness

and tidiness in person and dress are also to be constantly insisted on. Another point of great importance is that bad habits of all kinds, to which these children are particularly prone, must be watched for and checked at their earliest beginning. This applies not only to such things as masturbation, thumb-sucking, and dirt-eating, but equally to little tricks of manner and expression (grimacing, unrestrained gestures, making unpleasant noises), which do the children much harm by drawing attention to their defect and making them objectionable to others. The acquisition of good manners, including good temper, is of far more consequence to the child in most cases than that of reading or writing, and the ability to speak nicely and to use a knife and fork like other people is for him an invaluable accomplishment.

Thoroughness in everything, so far as it is practicable, is of inestimable importance. The mother must never acquiesce in the child's doing less than his best because he is weakly.

5. *Cultivate the Moral Character.*—Prompt obedience is as all-important in the education of character in mentally defective as it is in ordinary children. Ideas of justice, honesty, truthfulness, affection, unselfishness, and gentleness to younger children and to animals can and should be inculcated. If we exclude some rare cases of so-called "moral imbeciles," we may say that there are few mentally defective children who have not some sense of right and wrong to develop.

Institution Treatment.—If the home is comfortable and well conducted, it is generally far the best place for the mentally defective child, during the first five or six years of life at least. After that, if he is educable, there are usually great advantages in sending him to an institution. If he is being well brought up, he will, indeed, in most cases, do no harm whatever to his normal brothers and sisters. It is, however, very discouraging for him, as he grows older, to be

associated in his work and play with normal children. Not only are they apt to tease him, but the fact that they always do everything so much better than he does is very demoralising. If, again, he is kept apart from other children, he loses the immense advantage and pleasure of society and healthy rivalry. These he will have among children about his own level. Certainly, for most of these children, institution treatment is much happier as well as more instructive, because more stimulating, than treatment at home.

Simple Primary Amentia (*Genetous Idiocy* (*Ireland*))

To this class belong the great majority of all cases of mental defect. It may indeed be held, provisionally, to include all the children of weak intellect whom we cannot assign to any of the other special groups.

The causation of simple primary amentia is obscure. Probably a neurotic heredity has much, and parental alcoholism and tuberculosis have little, to do with it.

As the condition is not, in its lesser degrees, characterised by paralysis or by any gross visible fault of bodily conformation, it is often difficult, if not impossible, to recognise it in early infancy. Severe cases, however, are easy to distinguish very soon after birth. The babies show too little of the normal automatic movements of healthy infancy, and their voluntary motor faculties and speech fail to develop at the proper time. Often also they obviously do not feel, hear, or see like healthy children. Most of the bad cases do not recognise their own mother's face, many do not know her voice, and only recognise her, if at all, by the way she handles them. Their gestures and behaviour, even as infants, are strikingly abnormal, and if they gain control over their bladder and bowel at all, they are very late in doing so. A large proportion of these children take frequent epileptic attacks.

As they grow older, their weaknesses become increasingly obvious. When they learn to talk, their speech is more or less indistinct and defective. In many cases there is a constant dribbling of saliva from the mouth. When they walk, their gait remains clumsy and like that of a younger child. They go with their heads forward and their arms hanging in front, their feet are planted far apart, their pelvis often moves too much in walking and the joints of their lower limbs too little. Their hands are generally flabby and nerveless. They are difficult to teach, because they are unable to concentrate their attention on one subject for any time; and they cannot persevere, even in things they like at first. Many of them seem to have no common sense at all, and do not realise their position or their proper relation to others. Others are altogether without the normal shyness of childhood, and some are morbidly shy and self-conscious. They are apt also to show lack of self-control, to laugh and cry without sufficient reason, and to get into sudden unreasonable fits of passion.

Children of this class who are but slightly affected make up the majority of the "Mentally Defective Children" in the Special Classes of the Board Schools. Such slight cases are often not recognised as abnormal in early infancy, because they have wits enough to perform passably all the duties required of ordinary babyhood. As they grow up, however, more is expected from them, and their shortcomings become increasingly obvious. They are generally slow in learning to walk and to speak. In outward appearance there may be little amiss, but often their heads are distinctly too small and the frontal region especially poorly developed. Their gait also is apt to show, to some extent, the peculiarities already alluded to.

In many the deficiency is mainly noticed, while they are children, from the incompetent way in which they do their

school work both mental and manual. They remain far behind normal children of their own age. If a child with whose education special pains have been taken is not able to pass the Fourth Standard by the time he is fourteen, he may, as Dr. Clarkson has suggested, be fairly classed as mentally defective.[1]

In after life the weakness in will power and in self-control of these individuals is very noticeable, and renders them unfit to enjoy the privileges of independence. When left to themselves, they almost invariably come to grief in one way or another. If, however, they are carefully looked after from the first, and shielded from the temptations which they cannot resist, they may become, in a measure, good and useful citizens. So long as someone else is at the helm, to use Dr. Tredgold's apt simile, many of them can work their passage; although, for the most part, they are quite unable to steer their own course upon life's stormy sea. When these facts are realised by the public authorities, more money will be spent in residential institutions for the feeble-minded, and less will then be needed than is used at present for keeping them in workhouses, prisons, and Magdalene asylums.

Microcephalus

Microcephalic children can be recognised in early infancy by their very small and peculiarly shaped heads (p. 55, Figs. 19 and 20), and by the fact that the fontanelle closes abnormally early, if indeed it is not closed at birth. Apart from the cranium, the child's body appears normal and well

[1] A normal child, under ordinary circumstances, should be ready to be promoted from the Infant Department when he is about seven years old. The average age at each Standard may be given as follows:—

Standard I. . .	7–8 years.	Standard V. . .	11–12 years.
,, II. . .	8–9 ,,	,, VI. . .	12–13 ,,
,, III. . .	9–10 ,,	,, VII. . .	13–14 ,,
,, IV. . .	10–11 ,,		

grown in infancy, although in later life it is usually undersized. There is, in typical cases, no paralysis or spasticity of the limbs; and the features of the face, apart from the small forehead, are regular and well formed.

In cases in which the head is very small, the children are usually strikingly unobservant in early infancy, and quite apathetic unless they are hungry. In later childhood, however, they may be very active in body, although their mental development is always of rather a low type. They are extremely restless, inquisitive, and greedy, and most of them seem capable of very little affection. The prognosis both as to life and mental progress is usually bad. Microcephalic children are often subject to fits. The majority of them die in infancy. Very little improvement can be expected from educational influences in cases that are at all well marked. In slight cases, however, the wholesome occupations of institution life may greatly lessen both the abnormal restlessness and the tendency to convulsions. The operation of craniectomy used to be recommended in order to give more room for the brain to grow. The premature ossification of the cranium, however, is the result and not the cause of the brain not growing; and, practically, the operation has never been found to improve the mental condition.

Mongolism (*Mongolian or Calmuc Imbecility*)

This name has been given to a quite distinct class of mentally defective children, whose features bear, as the late Dr. Langdon Down pointed out, certain curious resemblances to those of the Mongolian races. The condition is a very common one. According to Dr. Shuttleworth, it accounts for about 5 per cent. of all imbeciles; and of the mentally defective children who are recognised as such *in infancy*, certainly from 10 to 15 per cent. at least are mongols. The whole appearance of these babies, and especially that of their

faces, is so characteristic, that any one familiar with the condition can recognise it even at the time of birth. They are curiously unlike the other members of their own families, and curiously like one another. They look, indeed, as if they belonged to a distinct species of the human race. When we consider more closely their distinctive physiognomy, we find that it depends on a large number of small peculiarities. None of these is constantly present and none is pathognomonic of mongolism; but, grouped together as we find them, they form a readily recognisable clinical picture (Figs. 108 to 114).

Causation.—Mongolism is obviously due to an intra-uterine arrest or perversion of development, but the cause of this is still quite obscure. It has been pointed out that many mongols come at the end of long families, when the mother may be regarded as worn out by repeated pregnancies. This is so far true, but a considerable number of the cases also are first-born children (sixteen out of one hundred and three), and the really important point is not the number of the mother's previous pregnancies, but her age at the time of the child's birth. It is only rarely that a young mother gives birth to a mongol. In forty-two of my cases in which this point was inquired into, the mothers were over forty in eighteen, and under thirty in two only. The average age at the time the child was born was about thirty-eight. There is no reason to think that either congenital syphilis or alcoholism has anything to do with the causation of mongolism.

Symptoms.—The child's features are small, short, and rounded, and very often, like the rest of the body, they are reddish in tint. The head also is short (brachycephalic), rounded, and strikingly devoid of eminences. The eyes are sometimes rather near one another, and in most cases the axes of the palpebral fissures are abnormally oblique—the

FIG. 108.—Boy aged 18 months.

FIG. 109.—Girl aged 2 years.

FIG. 110.—Girl aged 3 months.

FIG. 111.—Boy aged 8 months.

FIG. 112.—Girl aged 6½ months.

MONGOLISM.

outer canthus being higher than the inner. In a large proportion, also, there is a marked development of the so-called epicanthic fold of skin at the inner angle of the eye (Figs. 112 to 114). Nystagmus, sometimes of the ordinary conjugate horizontal type, and sometimes of the variety seen with head-nodding (p. 323), is common—about one in five have it. Blepharitis very often occurs. The nose is snubbed and the nostrils often sharply triangular in shape. Adenoids are nearly always present, and even when they are not large, they may cause considerable obstruction owing to the naso-pharynx being so abnormally small.

The tongue often protrudes from the mouth when the child is at rest, as if it were too big for it. This appearance, however, seems to be due to the abnormal shortness of the mouth rather than to any real longness of the tongue. During the early weeks of life the surface of the tongue seems quite normal. As the child grows older, however, (generally between the third and ninth months) the papillæ become gradually much enlarged and the surface ultimately acquires a raw granular appearance. Later—generally during the third or fourth year—marked transverse fissures appear crossing the dorsum (Fig. 114). In all mongols over six, fissuring of the tongue is a characteristic symptom. This peculiar abnormality of the tongue is specially interesting, because, unlike all the other features of the disease, it is not present at birth. Its development may be partly due to a congenital vulnerability of the organ, but probably it depends to a considerable extent on the persistent way in which these children suck their tongues.[1]

The teeth are generally small, and tend to become yellow and to decay early. In many cases the central incisors have a peculiar slanting position in the jaw, so that their crowns form an angle with one another, with the concavity

[1] Thomson, *Brit. Med. Journ.*, May 4, 1907.

FIG. 113.—Mongolism. Boy aged 3 years. (Dr. Melville Dunlop's case.)

FIG. 114.—Mongolism. Girl aged 9 years. Showing fissuring of tongue. (Dr. Melville Dunlop's case.)

generally forwards. The ears tend to be rounded and simply convoluted ("shell-shaped"), and they often project more than usual. The hair is generally poor and dry in older children; alopecia areata is very common. The skin is soft in young infants, although it becomes dry and harsh in later life. The mottling on the limbs which is characteristic of infancy is often present to an exaggerated degree in mongol babies.

The limbs are soft and small-boned, and their joints have unusually lax ligaments, so that they are easily hyper-extended. Cubitus varus is occasionally present. The hands are specially characteristic, and generally differ markedly from those of cretins. The wrist and the meta-carpal portion of the hand are small, and the latter very soft from the smallness of the bones and the yielding character of the ligaments. The fingers are rather thick for the size of the hand, but they are not so square-pointed as those of cretins, nor is their skin wrinkled to the same extent. The little finger is often dwarfed, and shows an exaggeration of the normal curve towards the mesial line. Occasionally one or more of the distal or second phalanges of some of the fingers may be too small; and the nails may be deformed.

A large proportion of mongol babies show signs of congenital heart disease (sixteen out of seventy-seven under four years old). Garrod[1] and others have drawn attention to the fact that congenital cardiac malformations are apt to be associated with all other kinds of developmental defect. One would therefore expect the heart condition in these infants to be of the nature of a persistence of fœtal openings. It may be mentioned, however, that out of four cases which I have examined post-mortem, only two showed a simple develop-

[1] "On the Association of Cardiac Malformations with other Congenital Defects," *St. Bart. Hosp. Rep.* vol. xxx.

mental malformation (a defect of the interventricular septum). In the other two [1] there was evidence of extensive intra-uterine endocarditis. In older mongol children congenital heart disease is rare, as the cardiac defect greatly diminishes the infant's chance of survival.

These children develop slowly in many ways. The dentition is generally very backward. In two-thirds of them the first teeth do not appear until after the end of the first year, and often not till eighteen months or two years. In the rest, the first few teeth come fairly early, but the others are usually very late and irregular in their appearance.

The muscular movements are slow of being acquired, so that the baby often does not hold up his head till the sixth or even the ninth month, or sit till the end of the first year or later. He generally does not walk before the third or fourth year, and rarely becomes very agile. The grasp is also usually feeble and fumbling. Speech is learned late and slowly, and is guttural and indistinct. The disposition is often bright and lively; and the child, although he is distinctly backward, may be quick at doing many small things which are learned by imitation.

The body growth is almost always stunted, even from birth, so that the infant looks much younger than he really is. As he grows older the dwarfing becomes more noticeable. The general strength also is much below the average, so that acute diseases of all kinds are generally badly borne; and slight bronchitis is apt to lead to serious atelectasis and pneumonia. Fits occur occasionally, but not so often as in most other forms of imbecility. Obstinate catarrhs of the conjunctivæ, nose, and throat are very common, and most mongols have a tendency to bronchitis and broncho-pneumonia. From these chest affections they often recover surprisingly, but many die from them—especially when

[1] For an account of one of these see *Edin. Hosp. Rep.* vol. vi., 1900, p. 76.

they are secondary to measles, whooping-cough, and influenza. The liability of these children to succumb to any acute disease is such, that only a very small proportion of them survive infancy or early childhood. If they reach puberty, they are usually fairly robust, but the few who live beyond forty get to look very old.

Prognosis.—In answering questions as to the child's future capabilities, it must be remembered that these children always improve considerably when time is allowed for their retarded development, and sometimes they make an unexpected degree of progress under careful training. From the earliest infancy, however, it may be foretold that, although they will never be more than imbeciles of a somewhat low grade, they will almost certainly be cleanly in their habits and amiable and affectionate in disposition. The better ones among them may in time be taught to read and write a little, and will learn to conduct themselves almost like ordinary children in their home life. They will never, however, be able to earn a living.

Treatment.—At or about puberty mongols often become very fat. When this occurs, the administration of thyroid may be of some use. Under other circumstances, so far as my experience goes, it is of little or no value in the treatment of this disease. Removal of adenoids, if they are causing symptoms, is generally well worth doing, as the children often gain considerably in brightness after the operation.

Chronic Hydrocephalus (*Congenital and Acquired*)

This is not a very uncommon cause of mental defect. In most cases it is congenital in origin, although the head may not begin to enlarge for some time after birth. The pathogenesis of these cases is extremely obscure.[1] Generally the

[1] H. J. Stiles, "Contribution to the Morbid Anatomy and Pathogenesis of Chronic Internal Hydrocephalus," *Edin. Hosp. Rep.* vol. iv., 1896, p. 517.

fluid is contained in the ventricles, and only rarely is it on the surface of the brain.

Sometimes acquired hydrocephalus arises from undiscoverable causes, and occasionally it is set up by the presence of a cerebral or cerebellar tumour. The commonest cause of it, however, is basic meningitis.

Hydrocephalus is easily diagnosed by the enlargement and altered shape of the head (Figs. 25 and 26) and, in the early stages, by the downward direction of the eyeballs (Fig. 23). The child's body is generally very puny and weak, and he is often subject to convulsions.

If the disease be at all severe in degree, there will always be some permanent damage done to the intellectual functions. In slight cases, however, these may scarcely suffer at all; and even in severe cases, the effect is usually less than might have been expected from the appearance of the head. Hydrocephalic imbeciles are often gentle and amiable in disposition, and are usually capable of a considerable amount of education. The prognosis as to mental improvement is generally much better in the congenital cases than in those that are acquired.

Epilepsy with Amentia

A very large proportion of mentally defective children take epileptic fits. These cases may be divided into three groups[1] according as their convulsions are—

1. A mere complication of primary amentia.

2. A symptom of true idiopathic epilepsy which is causing amentia.

3. A sign of some gross cerebral disease which is causing both epilepsy and amentia.

It is often impossible to be sure to which group an

[1] Tredgold, "The Relations of Epilepsy and Amentia," *Brit. Journ. of Children's Dis.*, July 1904.

individual case belongs. The term "epileptic imbecility" should, properly speaking, be restricted to the second group.

In all cases in which epileptic convulsions occur, their presence increases the seriousness of the case, and greatly lessens its hopefulness. In true epilepsy with amentia the prospect of improvement under special teaching is very small while the convulsions continue. If they cease, however, considerable improvement may take place.

Amentia due to Gross Cerebral Lesions (*Paralytic Imbecility*)

In any form of paralysis from cerebral disease or injury there may be some degree of mental impairment. In cases of cerebral diplegia (Fig. 115) and hemiplegia from meningeal hæmorrhage at birth or from injury, in polioencephalitis, and in chronic hydrocephalus following meningitis, the damage to the intellect may be very severe or it may be comparatively slight, according to the parts of the brain damaged. Many slightly paralysed children who are by no means imbeciles have a slight degree of mental instability and emotional weakness, or a tendency to epileptic convulsions.

Fig. 115.—Idiocy from Infantile Cerebral Paralysis. Girl aged 14 months.

In many cases of severe spastic diplegia the child has considerable mental capacity and fairly good judgment. Occasionally, even when the limbs are very spastic and

choreic, a surprising amount of manual education is possible. Some of these children develop great powers of perseverance, and may in time be taught to do quite difficult things—though, of course, never very deftly or gracefully.

Amaurotic Family Idiocy (*Infantile Cerebral Degeneration*)

This is a rare and fatal family disease of infancy which differs from all other known affections of the nervous system in being entirely confined to members of the Jewish race. The first case was described by Mr. Waren Tay in 1881, and since then a large number of papers have appeared on the subject by B. Sachs, Kingdon, Risien Russell, and many others.

The chief symptoms are summarised as follows by B. Sachs:[1]—

"1. Mental impairment, observed during the first few months of life, and leading to absolute idiocy.

"2. A paresis or paralysis of the greater part of the body, and this paralysis may be either flaccid or spastic.

"3. The reflexes may be deficient or increased.

"4. A diminution of vision terminating in absolute blindness (changes in the macula lutea, and later an optic nerve atrophy).

"5. Marasmus, and a fatal termination, as a rule, about the age of two years.

"6. The occurrence of the affection in several members of the same family."

In some cases, nystagmus, strabismus, and hyperacuity of hearing also occur. Convulsions are occasionally observed, but are not a characteristic symptom of the disease. The temperature remains normal, and nothing abnormal is found in the abdominal and thoracic organs.

[1] *New York Med. Journ.*, May 30, 1896.

The children seem perfectly well in every way till about the end of the third month. At that time the mother may notice that the child's muscles, especially those of the neck, are getting weaker and that he seems to see less than he did. By the fourth or fifth month the ocular appearances have developed. These are as follows; they are easily recognised, and they are pathognomonic of the disease:—A whitish grey oval patch, with its long axis horizontal, is seen in the macular region. It is about twice the size of the optic disc, and is raised slightly above the general surface of the retina. In its centre is a small dark cherry-red spot. Later, optic

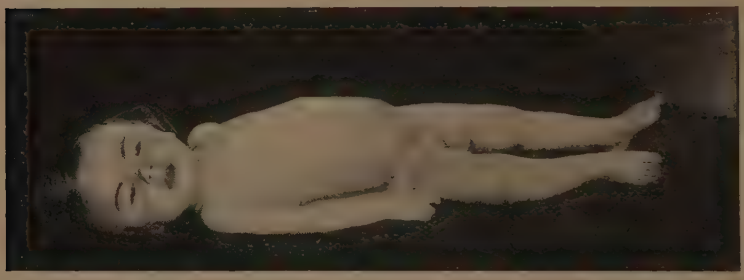


FIG. 116.—Amaurotic Family Idiocy. Late stage. (Dr. W. B. Drummond's case.)

atrophy sets in, and the child ultimately becomes quite blind as well as paralysed and idiotic (Fig. 116).

The etiology of the disease is quite unknown, and the pathology is still obscure. In a recent conjoint paper,[1] Drs. Poynton, Parsons, and Gordon Holmes come to the conclusion that it is a primary disease of the nerve cells, and that it is due to some inherent biochemical property of the protoplasm of the cells. They are convinced that it is not due to arrested development nor to the action of bacterial toxins.

The cases are always fatal, and no known treatment has any effect on their progress.

[1] *Brain*, 1906, p. 180.

Progressive Dementia due to Congenital Syphilis (*Developmental or Juvenile General Paralysis*)

The number of children met with in imbecile institutions who owe their mental defect to congenital syphilis is very small. In the practice of children's hospitals and dispensaries, however, the proportion of mental cases due to this cause is much larger. Some of these die before they are old enough for institutions. And even if they do survive, they are often not sent to such places because of their extreme infirmity and obvious inability to benefit from special training.

In some instances syphilitic brain disease begins in infancy with convulsions (p. 321), and the form of idiocy which results allows of but small improvement in later childhood (Fig. 117). Very often, indeed, these cases end, like the others, in dementia. In the great majority, however, of syphilitic cerebral cases in children the characteristic mental peculiarity is the steadily progressive course of the dementia which they show. Indeed, whenever this symptom is met with in childhood, apart from epilepsy, a specific element may be suspected to be present.

Progressive dementia due to congenital syphilis, when it sets in in younger children (three or four onwards), generally assumes the type of an advancing spastic diplegia with slowly increasing debility and contractures, often with recurrent convulsive seizures, and occasionally with severe pains in the limbs and trunk; the mental state being one of simple and rapid deterioration.

In older children (from eight or ten onwards) and adolescents, we meet (in larger numbers as the age increases) with cases which show more or less close resemblance in their bodily and mental symptoms to adult general paralysis (the so-called "developmental or juvenile general paralysis").

No distinct line can be drawn between these two types of cases. They are only different phases of the same disease. In their morbid anatomy, also, they are not to be distinguished from one another, and the pathological appearances of both closely resemble those met with in adult general paralysis.[1]

Juvenile general paralysis differs from the adult type in various particulars. It affects girls as often, if not oftener, than boys. Frequently the patients are children who have since early childhood been to some extent mentally defective. Spastic symptoms are much more prominent. The mental state is one of more simple and more steadily progressive dementia. Hallucinations are comparatively rare, and the symptoms generally show no remissions.

FIG. 117.—Idiocy from Congenital Syphilitic Brain Disease. Girl aged 8½ years.

In the more characteristic cases, the early symptoms often consist in attacks of congestive headaches with vomiting, or in ill-defined epileptiform congestive attacks. Sometimes there is a passing loss of consciousness or of speech. Later, the eye symptoms develop. There is often irregularity in the shape and size of the pupils and loss of the pupil reflex. Optic atrophy sometimes occurs. The knee jerks become greatly exaggerated, and in some cases ultimately lost. The plantar reflex gives

[1] Thomson and Dawson, *Lancet*, Feb. 16, 1895; Thomson and Welsh, *Brit. Med. Journ.*, April 1, 1899.

an extensor response. In some cases a chorea-like tremor is one of the early symptoms, and the articulation may also be characteristically affected.

The mental deterioration is marked and steadily progressive. The child becomes more and more like a baby in his ways, and loses his memory, his interest in outside things, and his natural affection. If there are younger children in the house, he may be very jealous and attack them. Although hallucinations are often apparently absent in the younger cases, there are sometimes a good many of a childish sort. The defective speech and other symptoms get worse and worse, and the child becomes emaciated and quite paralysed. The limbs develop severe contractures.

The duration of the case, if no intercurrent disease sets in, is relatively long—sometimes about two years, generally three or four, and occasionally as much as six or seven. In the older cases puberty is deferred and generally does not appear at all.

No treatment, specific or otherwise, has any effect.

Sporadic Cretinism

Symptoms.—The characteristic appearances of cretinism as it is seen in adults and older children are readily recognised. The extremely stunted growth, large head, relatively short, thickset limbs, thick, dry, redundant skin, with supraclavicular swellings, bloated features, and often protruding tongue, and the other well-known symptoms, form a clinical picture which is not easily forgotten or mistaken for anything else (Fig. 118).

None of these marked symptoms, however (with the exception of the protruding tongue), are usually present at birth except to a slight degree, so that the condition is less easily diagnosed in young children than in older patients. Cases of greatly deformed new-born cretin babies have, indeed,

been described with large supraclavicular swellings and other characteristic appearances, but these must be extremely rare, if they ever occur, in this country. As a rule, even in cases which afterwards present the severest type of the disease, the child's relatives see little amiss with him until he is several months old. All that the mother usually notices at first is that the child is too quiet and dull, that he does not cry out like other children, and scarcely ever laughs. He tends to be extremely constipated. The protrusion of the tongue is also often remarked on, but no other physical abnormality is observed. His teeth may come at the usual time or may not appear till the second year. He may walk as early as fifteen months, but more frequently not till he is two, three, or four years old.

FIG. 118.—Sporadic Cretinism. Girl aged 22 years.

The tardy development of the characteristic signs of the disease makes it especially important that we should be on the outlook to mark its earliest indications. There is good reason to believe that the ultimate degree of improvement in these children varies directly with the earliness of the age at which the treatment is begun.

Although the mother may fail to see anything wrong with the child at first, careful examination will reveal quite enough physical change to establish a diagnosis of the cause of the dulness even in very early infancy (Figs. 119 and 120).

The face will be pale usually and markedly puffy, the forehead always somewhat wrinkled when the eyes are open, the hair dry and scanty, and the fontanelle very large. Snoring at nights, also, is generally present. There may be some fulness in the supraclavicular region, although distinct tumours rarely form there in infancy; and the ease with which the tracheal rings can be felt will indicate an absence or defect of the

FIG. 119.—Sporadic Cretinism. Boy aged 7½ months.

FIG. 120.—Sporadic Cretinism. Girl aged 15 months.

thyroid. The broad, thick, short hands, with the wrinkled seemingly redundant skin, are very characteristic, and will sometimes be as helpful in the diagnosis as any other single feature. The temperature is subnormal.

As the child grows older his development lags behind (Fig. 121), and the characteristic cretinous appearance becomes steadily more striking. The myxœdematous swelling increases in the face and elsewhere, the belly becomes more

prominent, and marked lordosis develops. There is generally an umbilical hernia. Circumscribed soft swellings appear above the clavicles and in front of the axillæ. The dryness of the skin increases, and the hair is scanty and dry. The fontanelle remains widely open. The milk-teeth may or may not be late in coming, but generally they remain far too long in the gum, and I have seen them all present as late as the nineteenth year.[1] The child's growth and activity are greatly interfered with, so that at ten or twelve years old he often has not the size or strength of a boy of three or four. The mental condition in an ordinarily severe case is that of imbecility, but in slighter forms of the disease the child seems merely backward. He is dull and apathetic, slow of movement and of apprehension, but neat and tidy in his ways, and docile and quiet, unless he is teased. Speech is generally long of being acquired, and the words used are few.

FIG. 121.—Sporadic Cretin. Girl aged 7 years.

Diagnosis. — Slight cases of cretinism are sometimes met with (Fig. 122) in which there is little beyond stunted growth, delayed closure of the fontanelle, and some degree of mental dulness. Confirmation of the diagnosis is to be sought in the remarkable improvement which follows thyroid treatment (Figs. 123 and 124).

The two morbid conditions most apt to be mistaken for

[1] *Edin. Med. Journ.*, May 1893.

Fig. 122.—Before Thyroid Treatment.
Age $4\frac{11}{12}$ years; height 32 in.

Fig. 123.—After 7 Months' Treatment.
Height $34\frac{1}{4}$ in.

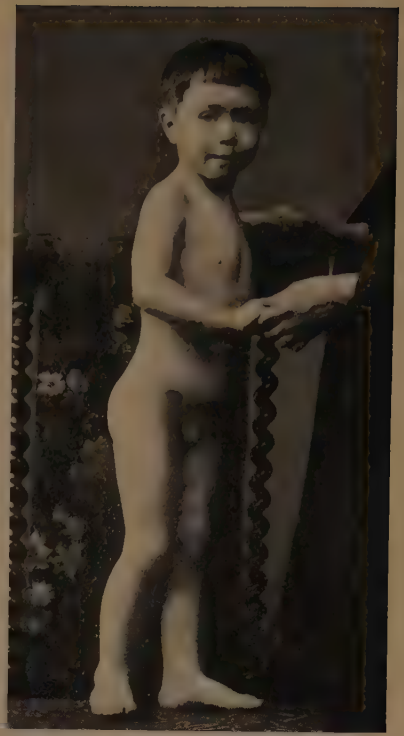


Fig. 124.—After 12 Months' Treatment.
Age $5\frac{1}{12}$ years; height $37\frac{3}{4}$ in.

cretinism are mongolism and achondroplasia. In mongolism the likeness is not very great even in older children. In infancy the mongol and the cretin have really little in common beyond the mental backwardness, the frequently protruding tongue, the scanty dry hair, and the general fact that they are rather ugly-looking babies. The mongol differs from the cretin in having a soft skin, rather small-boned limbs, a comparatively thin neck with an apparently normal thyroid, a normal temperature, and the peculiarity of the hands already described (p. 432).

The resemblance which achondroplasic dwarfs have, at birth, to cretins is in some ways striking, but it is *adult* cretins that they resemble. The differential diagnosis is considered elsewhere (p. 490).

When a cretin has been treated for a short time, even intermittently, with thyroid, the diagnosis often becomes very difficult, if not impossible.

Treatment.—This consists in the continued administration of some preparation of thyroid by the mouth. The fresh raw gland is probably more active and trustworthy than any of its preparations. It may be given to a young child in doses of $\frac{1}{16}$ to $\frac{1}{8}$ of a lobe *twice a week* to begin with, and may be increased according to its effect. It is a curious fact that the improvement in cases where thyroid is given twice a week seems usually just as continuous and satisfactory as that seen when the remedy is administered in small doses daily or every few hours.

Generally, however, it is much more convenient to use one of the manufactured preparations and to give it once daily. The tabloids prepared by Messrs. Burroughs & Wellcome are probably the form most widely used, and they do well, provided they have been kept dry. Two to five grains may be given to a young infant every third day to begin with. If no unpleasant symptoms arise, the dose may

be given every second, and then every day. In older children twice these doses may be used.

The right dose of thyroid differs considerably in different cases, and must be determined in each by watching the effect of the remedy on the child's appearance, vigour, weight, growth, and temperature. If he is gaining satisfactorily in height and is fairly active, and if his general condition is good, the dose is probably sufficient. If he is not growing as he should in height, is gaining weight rapidly, and is becoming torpid and disinclined for exertion, it will be well to increase the amount of thyroid given.

During treatment, except in very severe cases, the child may go about as usual, and no special diet is required. Should the patient become feverish and develop sickness, headache, and malaise, this shows that much too large a dose has been given. He should under these circumstances be kept in bed and the thyroid stopped for some days.

When thyroid treatment for cretinism is begun for the first time in older children or adolescents, it is important to keep the patient off his feet for a large part of the day. At that age the thyroid has a tendency to cause softening of the shafts of the long bones, and unless care is taken to prevent it, marked bow-leg will develop.[1] This danger does not seem to exist in children under the age of puberty.

Result of Treatment.—When the thyroid is carefully given, rapid and continuous improvement almost always ensues. Cases are, however, occasionally met with in which, for unknown reasons, the improvement is not nearly so satisfactory as usual. In rare instances the administration of thyroid sets up severe diarrhœa or causes heart failure, and has therefore, for a time at least, to be abandoned.

Generally the result of the treatment is most strikingly

[1] "Variations in and Limits of Improvement of Cretins of Different Ages under Thyroid Treatment," *Brit. Med. Journ.*, Sept. 12, 1896.

satisfactory. The temperature rises to, and remains at, the normal level. The unnatural swelling quickly disappears from the face and other parts of the body. The features lose their unnatural thickness and become more mobile, and the eyes look much brighter. At the same time the tongue ceases to be protruded, the voice becomes less guttural, and the child no longer snores at night. The abdomen diminishes rapidly in circumference, and if an umbilical hernia has been present, it disappears. The subclavicular swellings vanish at an early stage of the treatment. The skin loses its harsh and dry feeling and becomes soft, and the cheeks show a natural flush. In young patients the hair sometimes falls out, at first, in considerable quantities; but it is soon replaced by a new crop, which grows more rapidly and is softer and often of a different shade of colour. The limbs also become firm and strong, and the back straighter and more shapely. The retarded evolution of the teeth is actively resumed.

The growth of the skeleton is perhaps the most striking change of all. It begins at once and proceeds rapidly. The child often gains as much as two inches in height within the first two months, and may make as much as six or eight inches in the first year. After that, the rate of growth diminishes and approximates to the normal. In cases where the treatment is begun in early childhood, the return of normal growth affects all the limbs equally. When the patient is an adolescent, however, before the thyroid is given, the upper limbs grow freely and the lower remain very much stunted.[1] The appetite is usually much increased by the treatment, and the bowels become regular in action.

The mental improvement which occurs is apt at first to be greatly overestimated by the parents, because the child

[1] "Variations in and Limits of Improvement of Cretins at Different Ages under Thyroid Treatment," *Brit. Med. Journ.*, Sept. 12, 1896.

looks so much brighter and his movements are so much livelier than before. Within six months, however, there is unmistakable advance, and this continues and increases, the better nourished brain becoming increasingly capable of good work. The children become more inquisitive, more independent and enterprising, and more inclined to do things. They lose their shy, morose, self-centred disposition, and become happy, playful, childlike, and sociable.

In the milder cases, the arrears of bodily growth are soon fully made up, and the state of the intellect ultimately very nearly approaches, if it never *quite* reaches, the normal. There is, however, a considerable proportion of cases in which the bodily recovery is more or less complete, but still the child remains an imbecile; and, under these circumstances, the power of speech is often almost or quite in abeyance. It seems not improbable that some at least of these cases are really instances of primary amentia complicated by myxœdema. In those cases in which the treatment is not begun until later childhood, the disposition improves and the capacity for happiness greatly increases, but the intellectual condition always remains very defective.

CHAPTER XX

ON THE NOSE, MOUTH, AND THROAT

The Nose

The *conformation* of the nose is sometimes of importance in diagnosis, especially the well-known depression and broadening of the bridge which is characteristic of congenital syphilis. Poorly developed alæ often accompany chronic nasal obstruction, and an exaggeration of the hollows above the alæ—"nasal dimples"—are regarded by some authorities as an important indication of the presence of adenoids.

Nasal obstruction, when chronic, is generally in older children a symptom of adenoids, and in young infants more commonly of congenital syphilis. When it is acute, it is usually due to catarrh. This is of a simple nature in the great majority of cases, but it may be caused by streptococci, pneumococci, diphtheria bacilli, or other organisms. The presence of severe acute or subacute *nasal discharge* should *always* suggest a suspicion of diphtheritic infection.

Polypi are rare, and are only met with in older children. I have never seen them in children under nine years. Foreign bodies, such as buttons, peas, and fragments of toys, often find their way into the nose, but they rarely do any harm there.

Nasal obstruction, when it has set in acutely, often gives rise to great distress in little children. Apart from the local discomfort and headache which it is apt to cause, it may seriously interfere with the free entrance of air into the

chest. It constitutes, therefore, a really serious complication in pneumonia and in severe bronchitis.

Obstruction of the nasal passages may generally be very greatly relieved by the frequent use of simple alkaline and antiseptic nose-drops. A lotion composed of sod. bicarb. grs. x, ac. boric. grs. x, sod. chlorid. gr. i, and water ℥i, is a suitable application. It should be warmed to the temperature of the body, and may either be sniffed up by the child from the palm of his hand, or poured into the nostrils from a spoon or by a medicine dropper.

Epistaxis.—This is a common symptom in childhood. It may be due to a passing cerebral congestion, to catarrh of the mucous membrane, to ulceration from the child's picking at scabs on the front of the septum, to foreign bodies, or to injuries such as a fall on the nose. The presence of adenoids acts as a predisposing cause of epistaxis. Generally it is of no special importance. Occasionally, however, it occurs as a symptom of some serious condition.

It is sometimes, *e.g.*, met with from time to time in congenital heart disease, in rheumatism, in typhoid, in chronic nephritis, and in various blood diseases, such as leucocythæmia, purpura, and hæmophilia. I have seen it commencing in summer as a first symptom of hay fever.

The bleeding generally ceases spontaneously in a short time—especially if the child is made to stand with his arms up and his chest expanded, and has his feet warmed and cold applied to his nose. In obstinate cases, a small plug of cotton-wool soaked in adrenalin solution should be placed inside the nostril and pressed against the septum. The bleeding point is almost always situated near the front of the septum. Plugging of the nares is very rarely necessary.

The Mouth and Throat

The examination of the mouth and throat may be held to include the inspection—and often also the palpation—of the lips, tongue, teeth, gums, cheeks, palate, tonsils and fauces, pharynx, naso-pharynx, and larynx.

It would be difficult to insist too strongly on the importance of a thorough examination of the mouth and throat in all cases of feverish illness in childhood, whether there are any symptoms of throat affection or not. Many cases of unexplained fever are in this way cleared up at once.

Methods of Examination

If an infant is not frightened and is not teething, it is generally easy to induce him to open his mouth by gently touching his lips with the finger; and when the mouth is open, the finger can be readily passed along the gums till it touches the pharynx, and this compels the child to give a good view of the fauces.

To examine the back of the throat in children who may be inclined to resist the proceeding is sometimes difficult, and requires a little practice. The main points to be attended to are, firstly, to have the child facing a good light in such a way that when his mouth is opened the fauces will at once be illuminated without change of position; and, secondly, to have his arms held or secured to his side by a towel pinned round him, so that he may not be able suddenly to seize the tongue depressor or the hand that holds it. If the examination of the throat is carried out rapidly and gently on the first occasion, and no struggling allowed, it will be much easier the second time; while, if the child is allowed to struggle, it will be more difficult on each occasion. For ordinary cases, the handle of a common spoon is preferable as a tongue depressor to any special

spatula. It is quite as efficient, and much less likely to frighten the child.

Digital palpation of the fauces, pharynx, and naso-pharynx is extremely important, especially in young infants, because of the difficulty which often exists in getting a full and satisfactory view of the parts; and with practice much information can be got from it. It may be impossible to make sure of the presence or absence of a retro-pharyngeal abscess without examination with the finger, and palpation is also desirable for the recognition of adenoids.

When examining the throat with the right forefinger in older children, it is advisable to press the child's cheek between his side teeth with the fingers of the left hand (so as to prevent his biting the examining finger) or to use a gag.

The Lips

Pallor of the lips in children, as in adults, forms a trustworthy indication of anæmia; and even a slight purplish tinge of them is sometimes of importance in heart and lung cases as a sign of commencing cardiac failure.

Eczema and herpes of the lips are not uncommon in young children, and several forms of stomatitis, such as the aphthous, syphilitic, and diphtheritic varieties, may also affect them severely.

Cicatricial fissuring of the lips, as we have elsewhere noted, is an important sign of congenital syphilis.

Dribbling of Saliva from the mouth is met with under various conditions. It is normally present to a certain degree in many young babies, and it becomes very marked when there is any irritation of the gums, *e.g.* from stomatitis. It sometimes sets in during acute painful conditions of the throat, owing to the child's disinclination to swallow his saliva. Habitual dribbling is characteristic of imbecility. It is associated with lack of tone and power of the lips,

and may, in time, be greatly lessened by lip exercises and training (p. 421).

The Tongue

In new-born children the mucous membrane of the mouth is of a dark red colour, and for the first few months it is noticeably dry, owing to the want of saliva. For the same

Fig. 125.—Geographical Tongue.

reason the tongue is apt to be more or less coated in young infants.

It is not uncommon in children to find red areas on the dorsum covered with thinned epithelium and bounded by white or greyish elevated margins which have a crescentic or irregularly rounded contour. When this condition is exten-

sive, its irregular outlines often resemble those of a map, and hence it is often spoken of as the "*mapped*" or "*geographical*" *tongue* (Fig. 125). In children, the condition usually gives rise to no local pain, and it does not necessarily indicate any appreciable digestive disturbance. It has no connection whatever with congenital syphilis. It is also certainly not a tubercular lesion. H. Böhm [1] has, however, recently maintained, though scarcely proved, that it is to be regarded, like phlyctænular ophthalmia, as an indication of a scrofulous constitution. In the rare cases in which it causes pain or discomfort, and therefore needs treatment, it is best treated by krameria lozenges.

Tongue-tie is often complained of by mothers, but is seldom found to such an extent as to warrant operative interference. When, however, the frænum is so tight that the tip of the tongue is turned downwards when an attempt is made to protrude it, it should be divided, as it may possibly interfere with sucking in infancy, and in after life with articulation.

FIG. 126.—Whooping-cough in an infant aged 8 months, with congenital syphilis. Ulcer under tongue, œdema of eyelids, depressed bridge of nose, and nasal discharge.

A small erosion or *ulcer* is occasionally found *below the tip of the tongue* (Fig. 126) and often on the margin of the frænum. This almost always indicates the presence of whooping-cough, during the spasms of which the tongue is frequently shot out over the sharp lower incisor teeth. It may, however, occur in any form of cough if the teeth are sharp; and even, rarely, without cough, in cases where the movements of the tongue in sucking are very energetic.

[1] *Sammlung klin. Vorträge*, No. 249.

The *strawberry tongue*, which is characteristic of scarlet fever about the third day and onwards, is sometimes of great help in the diagnosis of that disease. It is well, however, to remember that it is very often absent in scarlet fever, and that a typical strawberry tongue is sometimes seen in other conditions.

Tongue-swallowing (*Aspiration of the Tongue*).—In some delicate babies there is a tendency to choke from the tongue falling right back into the pharynx and so obstructing the opening of the glottis, as is apt to happen in chloroform narcosis. For this to occur there must be a flabby tongue with a long frænum and generally loose attachments. There seems, however, to be no truth in the old idea that tongue-swallowing is due to too free division of a tight frænum.

I have seen aspiration of the tongue occur in the paroxysm of whooping-cough, and it occurs also in laryngismus. It is not very rare in cases of nasal obstruction from catarrh. The worst and most persistent case of the kind which I have seen occurred in a wasted baby with subacute posterior basic meningitis. In it the parts were so relaxed and flabby as to appear paralysed. Aspiration of the tongue is one of the causes of sudden death in young infants.

The Teeth and Gums

The examination of the teeth has been already discussed (Chap. III.), and stomatitis as it affects the gums will be dealt with later. We may mention here, however, the extreme importance of recognising even a slight degree of sponginess of the gums and of looking for further evidence of scurvy if it is present.

The Cheeks

Sucking-pads.—The only marked peculiarity of the cheeks in children consists in the prominence of the sucking-pads in

young babies.[1] These are little separate encapsulated masses of fat which lie outside the buccinator and masseter muscles, and prevent the falling in of the cheeks during the normal process of sucking. During the process of emaciation, these pads waste at first much more slowly than the surrounding adipose tissue. This results in the appearance on each cheek of a rounded projection, like half a small marble,

Fig. 127.—Sucking-pads in child aged 7 months.

which gives a peculiar look to the child's face, especially when he cries (Fig. 127). These projections are often seen in children under a year old who are wasting rapidly from any cause, such as diarrhœa. Rarely they are found also in older children. I have seen them very well marked in a boy of eleven years—a patient of Prof. Wyllie's—who had diabetes.

The Palate

In many infants, during the first few weeks, little yellowish white rounded nodules may be seen about the

[1] Ranke, *Virchow's Archiv.*, Bd. xcvii., 1884, s. 527.

mesial line of the hard palate. They vary in size from a pin's head to a millet seed, and are slightly raised above the level of the surrounding mucous membrane. These nodules are sometimes called *epithelial pearls*, being composed of collections of epithelial cells, and they have no clinical significance. In rare cases, in unhealthy infants, they may ulcerate. When unusually large, they may give rise to unnecessary anxiety, and have even been mistaken for manifestations of congenital syphilis.

Chronic *ulcers* are not uncommon towards the back of the hard palate in wasted babies of a few weeks. They are caused either by the nurse's finger, which has been too roughly used in cleansing the mouth, or by the continuous pressure of something which the baby has been allowed to suck. They often recover in a week or two under weak boracic applications, but sometimes they are very obstinate. These ulcers are sometimes called "Bednar's aphthæ."

Abnormal vaulting of the palate may often be recognised in early infancy, but the deformity is never very great until after the second dentition. The significance of such peculiarities is alluded to elsewhere (p. 416).

Perforation and destruction of the soft palate and of the pillars of the fauces are due to congenital syphilis in the great majority of cases, but occasionally may be caused by lupus, and rarely, to a slight degree, by diphtheria.

The palate should always be carefully examined in cases of suspected measles, as the *rash* generally appears there from twenty-four to forty-eight hours before it is recognisable on the skin. The rashes of scarlet fever and chicken-pox are also seen in this position.

Stomatitis

Various forms of inflammation of the mucous membrane of the mouth occur in childhood, and they are often of

considerable importance for several reasons. They are apt to be overlooked; they often give rise to a surprising degree of fever and general disturbance; and they may interfere greatly with deglutition, and consequently with the nutrition of the child.

Forchheimer[1] classifies the different forms of stomatitis as follows: (1) stomatitis catarrhalis; (2) stomatitis aphthosa; (3) stomatitis mycosa; (4) stomatitis ulcerosa; (5) stomatitis gangrenosa; (6) stomatitis crouposa (including stomatitis diphtheritica); and (7) stomatitis syphilitica. There is also a form of stomatitis due to streptococcal infection.

1. **Catarrhal Stomatitis.**—Catarrhal stomatitis may be local or general. When local, it is usually due to the mechanical irritation of a decaying tooth. When general, it is to be attributed to micro-organisms, although various mechanical, chemical, and thermal influences may predispose to their action. Most authorities believe that stomatitis is much more likely to occur at the time of teething than at any other time, but this is denied by others.

The symptoms consist in swelling, pain, heat, and redness of the general mucous membrane of the mouth, with high temperature (sometimes even 104°) and the ordinary symptoms of febrile disturbance. The tongue is covered with a thick yellowish white fur. There is generally also increased secretion of saliva, which runs out of the mouth, and some enlargement and tenderness of the lymphatic glands below the lower jaw.

The treatment consists in giving cold food if there is much pain, and in washing out the mouth with boric lotion (1 to 3 per cent.) or some other mild antiseptic solution.

In obstinate cases the mucous membrane should be painted once daily with nitrate of silver solution (½ to 1 per

[1] *The Diseases of the Mouth in Children (Non-Surgical)*, Philadelphia, 1892.

cent.), and 2 grains of chlorate of potash may be given internally every three or four hours.

2. **Aphthous Stomatitis.**—The etiology of aphthous stomatitis is not known, although various organisms have been described as its cause. It is regarded by Forchheimer and other authorities as not contagious, but it frequently occurs as an epidemic in several members of the same family.

The aphthæ appear as little rounded ulcers, which begin as vesicles, and usually have a yellowish exudation about their edges. They vary greatly in number in different cases, and the amount of general stomatitis which accompanies them also varies much. If the general stomatitis is severe, there is usually a considerable degree of fever (102° to 103°). In some cases the ulcers are accompanied by little redness of the intervening mucous membrane, and in these cases there may be no general disturbance. There is usually a good deal of local tenderness and consequent interference with the feeding.

The local application of glycerine and borax or boroglyceride, or permanganate of potash solution (1 to 1000), along with the internal administration, three or four times daily, of chlorate of potash (grs. ii) and tincture of perchloride of iron (♏ ii), is usually rapidly followed by recovery.

3. **Parasitic Stomatitis.**—Parasitic stomatitis, or thrush, as it is generally called, is due to the growth on the mucous membrane of an organism related to the yeast fungus (*saccharomyces albicans*). This organism occurs in the mouths of many healthy children, but the disease is only met with in very young infants or in older children who have been greatly weakened by disease. This is partly due to the fact that the normal movements of the healthy mouth are antagonistic to the growth of the fungus.

The disease causes, at first, small white raised spots on the tongue and on the inside of the cheeks. These look like

fragments of milk curd, but they cannot be removed without some force, and, when rubbed off, leave an abrasion behind. In severe cases these spots spread until they form a more or less continuous false membrane, and this may even extend to the throat and in rare cases down the œsophagus. When a portion of the white patch is removed, treated with liquor potassæ, and examined under the microscope, it is found to consist of the filaments and spores of the fungus, along with epithelial cells, milk globules, bacteria, etc. There is often catarrh of the mucous membrane between the patches.

The treatment consists in removing the spots gently by means of a soft rag moistened with bicarbonate of soda solution (℥i to ℥v), and in applying to the raw surface a solution of permanganate of potash (1 to 1000) or glycerine and borax. Everything that comes near the child's mouth, or has to do with his milk, must be carefully sterilised so as to avoid reinfection, and the general debility which is always present must be carefully treated.

4. **Ulcerative Stomatitis.**—This condition is met with in mercurial, lead, and phosphorus poisoning, and is sometimes a symptom of scurvy; but in the great majority of cases there are other as yet undiscovered causes. It may occur as a sequel to infectious illness, and it is a frequent complication of various chronic diseases. It is rarely found except in conditions of debility, and is seldom seen in early infancy, the patient being generally between five and ten years of age.

The ulceration begins on the alveolar margin of the jaw close to the teeth, and spreads to the neighbouring parts. It is never found where there are no teeth. The gum round the sores swells greatly, and the affected area may be very tender. If the case is neglected, the teeth may loosen and drop out and the jaw may even become necrosed. The patient has a cachectic appearance, and the glands below the jaw are usually enlarged. There is constant trickling of

saliva from the mouth, and it is often stained with blood. The tongue is covered with a dirty brownish yellow fur, and there is an extremely offensive odour from the breath.

When the affection is due to scurvy or to poisoning, the treatment of these conditions requires, of course, immediate attention. The special treatment consists in the administration of chlorate of potash and iron, and grs. ii of the former may be given along with ♏ ii of tincture of perchloride of iron every two hours. The child should also be made to wash out his mouth at short intervals with a weak solution of permanganate of potash (a teaspoonful of the liquor to a small cup of water), or a stronger solution may be used (1 to 1000) to paint the gum. The patient's nutrition and his hygienic surroundings must be improved, if possible, and precautions taken against infection.

5. **Gangrenous Stomatitis.**—Cancrum oris, or noma, is fortunately a rare disease. It usually occurs in children whose vitality has been very much lowered by one of the infectious diseases, especially measles; and it is probably due to the action of a special micro-organism.

The disease commences as a small red patch on the gum or on the cheek near the angle of the mouth, which rapidly spreads and soon assumes the characteristics of moist gangrene, destroying all the tissues affected (Fig. 128). In the great majority of cases the child dies in a state of collapse or from septicæmia or pneumonia. Occasionally recovery takes place with, or rarely without, treatment, and great deformity is always left. In girls, noma is sometimes met with on the vulva.

The treatment consists in a very thorough application of Pacquelin's cautery, pure carbolic acid, or some other escharotic.

6. and 7. **Diphtheritic and Syphilitic Stomatitis.**—These need not be specially described here.

8. **Streptococcal Stomatitis.**—I have seen one case in

FIG. 128.—Cancrum Oris following measles. (Dr. Harvey Littlejohn's case.)

which very severe pseudo-membranous stomatitis was due to streptococcus. It resisted ordinary treatment, and recovered satisfactorily when treated by injections of anti-streptococcus serum.[1]

[1] J. S. Fowler, *Arch. of Pediat.*, May 1901.

Catarrh of the Pharynx and Tonsils

Although sore throat may be present at any age, it is not so common in infants as in older children. When it occurs in infancy, its presence is usually first recognised by the child refusing his food or showing symptoms of pain on swallowing.

In older children, slight degrees of catarrhal sore throat often give rise to a persistent cough as the most prominent symptom.

The recognition of acute sore throat is generally easy if the fauces are inspected; but a diagnosis of its nature must be made with caution, as the presence of a sore throat with fever always suggests the possible commencement of one of the infectious diseases, especially scarlet fever, diphtheria, enteric fever, rötheln, measles, or influenza.

In older children, acute tonsillitis is not infrequently a manifestation of rheumatism, and the heart should always be carefully watched during an attack, as it is occasionally associated with endocarditis. When several children in a household suffer from sore throat, the condition of the drains should be suspected.

The treatment of sore throat in children does not differ from that in adults. In acute cases it is generally desirable to begin with a mercurial purge, and this has often a marked effect in relieving the throat condition. Small doses of tincture of guaiacum or of chlorate of potash may be given, and, in possibly rheumatic cases, salicylate of soda.

Chronic Enlargement of the Tonsils

This condition is very common even in early childhood. It gives rise, in many cases, to a certain amount of deafness or earache; and if it resists the use of astringent and

stimulant applications (F. 20 and 21), it should certainly be subjected to operation.

Adenoid Growths

Even in early infancy adenoid growths may be present. The number of children in whom they are to be found is very large, but in some of them an operation is not required. The change which their presence may produce in the face has been already referred to (p. 13, Fig. 9). The other symptoms are of various kinds.

In young babies our attention is usually drawn to the condition by marked indications of local disturbance. There is usually nasal discharge and obstruction with mouth-breathing, sometimes snoring respiration or even a sort of crowing respiration, which is apt to be confounded with congenital laryngeal stridor (p. 299). There is often also bronchial catarrh, occasionally some interference with swallowing, and frequently otorrhœa.

In older children one of the most striking symptoms is deafness, which may or may not be accompanied by recurrent acute attacks of middle-ear catarrh. Headache is also very common (p. 309), and a certain degree of mental dulness with loss of interest in things (aprosexia) is often observed. The speech may be noticeably nasal in tone. In some children there are recurrent attacks of more or less severe bronchitis, which usually start with a sore throat. In some there is a varying degree of asthmatic affection; in others a peculiar paroxysmal choking cough, which is apt to be mistaken for whooping-cough. When there is much nasal obstruction, night-terrors are often met with, and enuresis is not uncommon. General debility and languor are often partly due to the presence of adenoids.

The connection between the above-mentioned symptoms and the adenoids is abundantly proved by the immediate and

striking improvement which follows removal of the latter, in suitable cases.

The main *treatment* consists, of course, in removal of the adenoid growths by operation. In slight cases, however, great improvement often follows the regular use of an alkaline and antiseptic nasal lotion (p. 451), along with slow regular breathing, with free action of the abdominal muscles and other gymnastic exercises, all carried out *with the mouth shut.* These measures are also very advantageous after the operation.

Retro-Pharyngeal Abscess

In examining children with dyspnœic symptoms or sore throat—especially those under two—it is important to remember the possibility of retro-pharyngeal abscess. It is not a common condition, but its recognition and proper treatment are of great importance.

Chronic abscesses in this situation are often the result of *tuberculous disease* of the cervical vertebræ, and the pus is situated, at first, between the bone and the prevertebral fascia. In *acute* cases the abscess develops in front of the prevertebral fascia and pushes the posterior pharyngeal wall before it, so that it bulges into the back of the throat, interfering with deglutition and respiration. It is generally due to infection of the lymphatic glands by *pyogenic organisms* from the throat or elsewhere. It is the acute or subacute cases to which the following remarks apply.

The onset of the *symptoms* is usually insidious. The child is restless, and sometimes refuses his food, and seems pained when drinking. There may be some stiffness of the neck. The breathing early assumes a snoring character, especially when the child is asleep; but generally it is ten or fourteen days, according to Henoch, before the abscess is sufficiently large to cause interference with breathing. Gradually the respiration becomes more and more difficult,

and stridor accompanies both inspiration and expiration. The breathing is worse when the child is laid down. When the patient attempts to drink, he is apt to choke, and the fluid is coughed out of his mouth and nose. Generally neither hoarseness nor cough are present, but this is not always so, as the condition may be accompanied by laryngeal catarrh. Occasionally there is marked external swelling in the neck. The only certain means of diagnosis, however, is digital exploration of the pharynx, which at once reveals the presence of the abscess, even when it cannot be recognised by inspection.

The *treatment* consists in immediate incision of the abscess. In most cases this is best done through the mouth by means of a tenotomy knife, the child being laid on his face immediately after the incision, so that he may cough out the pus. Large abscesses should usually be opened through the neck.

CHAPTER XXI

ON RICKETS AND CERTAIN OTHER DISEASES AFFECTING THE BONES

Rickets

There are few of the diseases of children so important as rickets, because of the frequency of its occurrence, the large mortality which it causes secondarily, and the fact that it is generally an eminently preventable and curable condition.

Rickets is sometimes spoken of as a disease of the bones, and it is true that alterations in the skeleton form its main peculiarity from a pathologist's point of view. From a purely clinical standpoint, however, these may be regarded as less important than some of the other manifestations of the disease. Rickets therefore is not a bone disease, properly speaking, but a general disease of the nutrition, which affects the bones in a more characteristic manner than the other tissues.

Clinical Features

Frequency of Occurrence.—Rickets is one of the commonest diseases of early childhood. In Edinburgh, between 1895 and 1900, I found that rather more than 50 per cent. of the children under three years old attending my out-patient cliniques at the New Town Dispensary and Children's Hospital showed unmistakable signs of it. In larger towns, such as London, Glasgow, and Manchester, it is said to be even more prevalent. The disease is, of course, most frequent

and most severe among the poor, but among the upper classes also mild cases are very common.

Age of Onset.—Rickets is a disease of early infancy. Occasionally, it is said, infants have been born with undoubted signs of it, but generally no trace of the disease can be discovered until after three or four months. It is probable that in all cases of rickets the disease begins during the first year of life, although it is certain that a large proportion of them are not brought for medical treatment until the second year, and some even later. The degree to which most of the characteristic bone changes take place in the thorax, back, and limbs depends largely on the amount of movement of, and pressure on, the parts affected. Consequently, it is only when the scope of the child's activities enlarges that these deformities begin to obtrude themselves on the parents' notice and to arouse their alarm.

The clinical manifestations of the disease may, for the sake of convenience of description, be divided into (*a*) the *symptoms*, *i.e.* what the mother has noticed about the child—including the digestive and respiratory complications; and (*b*) the *physical signs*, which the medical man discovers on examining the patient.

(*a*) **Symptoms.**—In most cases, the first symptom which the mother notices is *excessive perspiration*. This is most marked on the head, neck, and upper part of the chest; less commonly it is all over the body. It is often very profuse, so that the sweat stands in beads on the forehead, and the pillow is so thoroughly wetted that it has to be changed from time to time. It is seen most commonly when the child is sleeping, but it also occurs while he is awake, on slight exertion; it often causes sudamina and miliaria. The excessive perspiration may cause undue anxiety on the part of the mother, who is apt to infer from it the presence of "water in the head."

Another symptom which is often complained of—perhaps more in older infants—is great *restlessness* during sleep, and a constant habit of throwing off the bed clothes. Even when the weather is cold, the child will be found again and again with his bare legs and arms lying outside the blankets. At the same time he will roll his head from side to side on the pillow until the hair on the back of it becomes crumpled and thinned. Restlessness of this sort is not found only in rickety children, but it is more common in them than in others.

Another thing which the mother often notices is the child's *disinclination to be moved.* His body and limbs seem tender, so that she can no longer use her accustomed freedom in washing and dressing him. He has to be very gently handled, or he cries. Extreme tenderness, however, is probably never due to rickets alone. It may be a symptom of infantile scurvy, or may be caused by a subperiosteal fracture or some other local injury.

The child shows a great disinclination to use his limbs. When he is left lying on the bed or sitting on the floor or on a chair, he keeps quite still, like an old man, and is not always on the move, as a normal baby should be. When his feet are put to the ground he raises them up and cries, instead of trying to stand like a healthy child; and if a relapse of rickets occurs after he is walking, he at once "goes off his feet."

There is often also—especially in long-standing cases—a history of *recurrent diarrhœa* with slimy and offensive motions alternating with constipation; or of attacks of *bronchitis* with each set of teeth or from slight exposure to cold. These are evidences of the unusual tendency to catarrh of the alimentary and respiratory mucous membranes which is characteristic of rickety children. There may also have been one or more of the *nervous complications*, which will afterwards be referred to.

FIG. 129.—Rickets, early case. Boy aged 21 months. Commencing affection of cranium, thorax, abdomen, and epiphyses.

FIG. 130.—Rickets. Girl aged 2½ years. Deformed thorax, large abdomen, slight curvature of arms, laxity of ligaments in lower extremity—the feet being turned backward without the child seeming to notice it.

FIG. 131.—Rickets. Severe affection of head and thorax.

FIG. 132.—Rickets. Severe affection of head and thorax.

(*b*) **Physical Signs.**—One of the most striking points about the rickety child is that he is *flabby*. He may or may not be thin, often he is unusually fat; except in long-standing cases, he is not specially anæmic: but he is always more or less soft and flabby, languid in his movements, and easily tired.

No effect on the child's growth may be noticeable during the advancing stage of the disease, but if the rickets is severe, and especially if it is so at an early period, there is always apt to be *stunting* of the figure.

The temperature is not raised. If fever is present, it is not the result of rickets, but indicates the presence of a complication.

The outline of the head is not altered in the early stages or in slight cases, but when the disease is severe and lasts for any time, it generally assumes the characteristic *square shape* (Figs. 27, p. 57, and 129 to 132). The *fontanelle* is almost invariably *larger than normal*, and its closure is delayed (p. 61), so that it may be found widely open at the end of the second or even the third or fourth year. Its margins also are abnormally thin and yielding. The coronal and other sutures often gape a little, and their margins may be soft and pliant like those of the fontanelle. *Craniotabes* of this slight form, or of the more marked degree in which there are little separate soft spots on the parietal or other bones (p. 62), is very commonly found in rickets when the patients are between three and eleven months old, and it may occur earlier. After eleven months it becomes less common, but I have seen it well marked in a child of twenty-two months. It is often the first unmistakable sign of rickets, as the beading of the ribs is sometimes difficult to make sure of in the earliest stages. A certain amount of bossing is also sometimes seen, especially in the frontal and parietal regions (p. 57).

The *jaws* are often affected and in time are apt to

become considerably altered in shape (Fleischmann[1]). The upper is compressed in front into a sort of beak, while towards the back its alveoli turn somewhat outwards. The lower jaw becomes angular instead of rounded in outline, the front being flat and the angles situated about the canine teeth, and its alveolar margin tends to turn inwards. The result of this change in the form of the jaws and in the direction of the teeth is to interfere greatly with the proper apposition of the upper and lower sets of teeth.

Dentition is almost always *delayed* beyond the normal time, and the intervals between the appearance of the teeth vary greatly in duration. The teeth are also apt to come *in the wrong order*, and to appear one by one instead of in pairs, as is customary under normal conditions. It is a disputed point whether the teeth of rickety children are more than usually prone to decay. In severe cases of rickets it is common for many of the front teeth to drop out without being carious, owing to alterations in the alveoli.

The effect of rickets on the chest wall is seen in *beading of the ribs* and in the various degrees of *thoracic deformity* which have already been considered (p. 253), (Figs. 75 and 129 to 133). Rickety *curvature of the spine* and its diagnosis from Pott's disease have also already been referred to (p. 65), (Figs. 36 and 133). Curvature arises early in the disease, and soon becomes severe if the child is allowed to sit up much.

The *abdomen* in rickety children is always *protuberant*. This is owing partly to the special weakness of the muscular walls, and partly to the recurrent dyspepsia and consequent accumulation of intestinal flatulence. It looks even larger than it is, from contrast with the narrowed chest. In a considerable proportion of cases the habitual flatulent distention leads to a marked diastasis of the recti muscles.

[1] *Klinik der Pädiatrik*, Bd. ii., Vienna, 1877.

Besides being displaced downwards by the alteration in the form of the chest, the *liver* is sometimes enlarged.

The *spleen* is also larger than normal in a certain proportion of cases. Considerable enlargement of the spleen is almost always present in those cases of rickets in which there is much recent thickening of the cranial bones, and some enlargement is often found in cases where the general symptoms of the disease are rapidly progressing. There seems to be every reason to regard the cases of great enlargement of the spleen in rickety children, which were formerly referred to as "rickety pseudo-leukæmia," as merely instances of splenic anæmia. In the great majority of rickety children the spleen is not appreciably enlarged.

FIG. 133.—Rickets. Boy aged 20 months. Square head; beading of ribs; spinal curvature.

Owing to the abnormal tendency to catarrh of the mucous membranes which rickety children exhibit, we often find enlargement of the lymphatic glands in them, but this is not caused by the rickets directly.

The urine is practically normal, there being no constant abnormalities discoverable by the ordinary clinical tests.

The changes in the bones consist of enlargement at the junction of the epiphyses and diaphyses, softening and bending, with occasional green-stick fractures, of the shafts. The *enlargement at the epiphyses* corresponds to the beading of the ribs, and may often be seen commencing by the third or fourth month, although it does not attain any great size until the child is old enough to use the affected limb more actively than at that age. They are generally first and most clearly seen at the lower end of the radius. In the lower

limb, the distal end of the tibia is the part where the first and greatest enlargement usually occurs. The legs are affected later than the arms, and the epiphyseal swellings of the leg bones do not usually attain a considerable size except in children who are trying to walk.

The *bending of the long bones* depends on the amount and direction of the pressure to which they are subjected. It does not occur to any extent in infants who are kept lying flat. Bending of the arms (Fig. 130) is commonly met with in severe cases, and is secondary to kyphosis. The child tends to assume a frog-like position, in which he tries to relieve his weak spine by bearing the weight of his head and shoulders as much as possible on his arms.

Outward bending of the legs (producing bow-legs), and also a degree of coxa vara, are commonly caused by the child standing and walking while the bones are too soft to support the weight of the body. Bowing of the lower limbs is more apt to take place in those children whose muscles and ligaments are little weakened by the rickets. When those structures are much softened, knock-knee with flat-foot is more likely to result. Antero-posterior bending of the femora occurs in severe cases when children are carried much on the arm, or sit for long on a chair with the legs hanging down; and a similar backward bending of the lower part of the tibia and fibula may occur if the child habitually sits with one leg laid over the other and the foot unsupported.

Fractures of any of the long bones may occur, and they are generally met with pretty late in the disease (Figs. 134 and 135). They are almost always green-stick fractures, and in some children several are found; they may be produced by very little force. Complete fractures are extremely rare. Green-stick fractures of the ribs are caused, as already mentioned (p. 254), by lateral compression of the chest with the hands, in lifting the child; those of the clavicle and

humerus, by lifting him by the upper arms. The bones of the forearm are sometimes bent and fractured by the child's suddenly tripping and falling while he is being encouraged to walk with the mother's hand firmly grasping his wrist. Under these circumstances, as the parent is usually right-handed, it is the child's left arm which is fractured (Fig. 134). Fractures are not common in the leg,

FIG. 134.—Rickets. Girl of 6 years. Badly united fractures of clavicles, right humerus, and left radius and ulna.

FIG. 135.—Rickets. Girl of 6 years. Badly united fractures of right humerus, and of ribs below right scapula.

but in the thigh they are often met with; they may be due to falls from a chair or other slight nursery accidents. Often, when fracture occurs, nothing is noticed but local pain on movement or on pressure; and it is only when callus is thrown out that the injury to the bone is recognised.

The peculiar conformation of the hands and fingers which

is often seen in severe cases has been already described (p. 80).

Extreme *laxity and extensibility of the ligaments* is a marked feature in many cases of rickets, and is most characteristic of the disease. Their softness contributes largely towards the deformity in rickety spinal curvature and bending of the limbs; it often also leads to flat-foot and knock-knee. When it is present to a considerable degree, the limbs can be twisted about in a surprising way, and the feet can be turned with the toes pointing directly backwards without inconveniencing the child (Fig. 130). When anti-rachitic treatment is successfully employed, this laxity of the ligaments rapidly diminishes.

Weakness of the muscles is as characteristic of rickets as bending of the bones. It may be severe in cases where the bones are but slightly affected. When this is so, the condition is sometimes spoken of as rickety pseudo-paralysis (p. 336), and it is liable to be mistaken for infantile palsy, or even for early pseudo-hypertrophic paralysis.

Course and Duration.—The course pursued by a case of rickets varies considerably, according to the age of the patient, his strength, his surroundings, and the treatment employed.

The bones most affected vary in different cases. This may be partly explained by the principle that rickets *tends to affect those bones which are in process of the most active development* (Baginsky [1]). Thus we find the cranium most severely affected in young infants, the thorax, vertebræ, and arms in those a little older, and the lower limbs in those children in whom the process is latest of developing. It is, I think, certain that *the degree of swelling present in the epiphysial ends of any of the bones is directly proportionate to the amount they have been moved.*

[1] *Practische Beiträge zur Kinderheilkunde.* H. ii. Rachitis. Tübingen, 1882.

The duration of the disease also varies indefinitely. If promptly treated, it may pass off in a few weeks. Often, treated or untreated, it lasts for months, and it may last for years. In estimating the duration of a case of rickets, however, we must distinguish clearly between actual presence of the disease and the signs of its former presence. The rickety patients seen in surgical wards are generally not suffering from rickets but merely from deformities resulting from it.

When rickets is really over, we find that the active symptoms disappear, the child gets firm and energetic in his movements, the excessive perspiration ceases, and he sleeps quietly; the teeth begin to appear, and the fontanelle closes; any nervous or catarrhal symptoms to which he has been liable no longer recur.

Pathology.—The pathogenesis of rickets is still extremely obscure. The old theories, which attributed it to the want of lime and phosphorus in the food or to the decalcification of the bones by lactic acid circulating in the blood, have long been abandoned. The subject, however, need not be dealt with here.

Etiology.—The causation of rickets, like its pathology, is far from being thoroughly understood, but there are several factors which are known certainly to contribute towards it. The most important of these are ill-health of the mother during her pregnancy, bad hygienic surroundings of the child, antecedent disease—especially digestive disturbances, and a defective diet.

Ill-health of the Mother.—It is very doubtful whether a father and mother who have suffered from rickets are more likely than other people to have rickety children. It is certain, however, that if a mother is feeble and anæmic during her pregnancy, her child is much more likely to become rickety than if she were strong at that time. It is

also found that the youngest children in large families, who are born when the mother is middle-aged and less vigorous than formerly, are often rickety, although the older children brought up under similar treatment did not become so. There seems to be a special liability for twins to acquire rickets, probably owing to their being inadequately nourished in utero.

Bad Hygienic Conditions.—The want of sunshine and fresh air is a very important cause of rickets. It is certain that many children who spend most of the day in the open air escape rickets entirely, when their diet would surely have caused it had they been more confined to the house. Children who live in towns are thus in much greater danger of becoming rickety than those who live in the country. The custom of living in "flats," so prevalent among the working classes in Scotland, is a very fruitful source of rickets, because, under the conditions present in these high tenement houses, free access of the young children to the fresh air is rendered peculiarly difficult. A thorough open-air treatment is almost as antagonistic to rickets as it is to phthisis. I believe that rickets is distinctly less prevalent in Edinburgh than it was twenty years ago, and that this is largely due to the extent to which the obvious success of the open-air treatment of phthisis has removed the old-fashioned prejudice against open windows.

Antecedent Disease.—Any debilitating disease may predispose to the onset of rickets, or may cause it, if present, to become much worse. Congenital syphilis, for example, is apt to act in this way, although it certainly does not always do so. To regard it, as Parrot did, as an essential cause of rickets, is a mistake. It is probable, however, that it modifies the manifestations of rickets to a certain extent, and especially predisposes to a marked affection of the cranial bones.

Digestive Disturbances.—Prolonged gastric or intestinal

disturbances are very apt to lead to rickets. They not only weaken the child's general condition, but, by preventing the absorption and assimilation of the necessary elements of the food, they have the same effect as improper feeding.

Improper Diet.—There can be no doubt that improper feeding is the most important element in the causation of rickets. We find it, or some digestive derangement which has the same effect, in all cases, while the other causes already mentioned are only sometimes met with. There seems to be a general agreement that the defect in the diet which is most likely to produce rickets is *the want of a proper proportion of animal fat. Deficiency of proteid material* is also important as a cause, and a lack of easily assimilable organic phosphates may perhaps have a similar, although less marked, influence.

These conclusions have been arrived at after an investigation into the circumstances under which rickets most commonly appears. We find it, for example, very common in children who are being fed on either diluted cow's milk or condensed milk, or any other form of food in which there is too little fat and proteid. It occurs in children on the breast if the mother has been nursing too long, so that her milk is poor in quality and deficient in one or both of these constituents. It is very frequently found in children at the time of weaning, owing to their mothers giving them too much farinaceous food and too little milk. In such cases the excessive amount of farinaceous food is probably injurious, partly because it diminishes the child's appetite for other things, and partly because, when given to any excess, it is apt to lead to indigestion.

Diagnosis.—Severe cases of rickets can scarcely be overlooked, and even slight cases are easy of recognition, provided the symptoms are looked for. Frequently, however, the real cause of the weakness is overlooked, and, in consequence,

proper treatment is not applied. Rickets may always be suspected if a child is late of teething or of walking, and if he has a history of recurrent bronchial or intestinal catarrh. Cases in which the muscular weakness is great and the bone affection not marked, are sometimes mistaken for either infantile spinal or pseudo-hypertrophic paralysis. The main respect in which they resemble the latter disease is their peculiar waddling gait and, particularly, the way in which they "climb up their legs" on rising from a sitting posture.

Prognosis.—If the unfavourable hygienic and dietetic conditions which are present can be got rid of, the rickety patient generally recovers rapidly. When the disease has not been severe or prolonged, all trace of it usually passes away as the child gets older, and by eight or ten years old even tolerably severe cases may show no symptom of their former affection.

Although rickets is not itself a fatal malady, its presence constitutes a dangerous complication in cases of respiratory disease. This is due partly to the way in which the softened ribs tend to collapse, and partly to the weakness of the muscles.

Nervous Complications of Rickets

There are four more or less common nervous symptoms which are regarded by many as manifestations of rickets, viz. facial irritability, laryngismus, tetany, and a variety of convulsions. The precise connection of these conditions with rickets is not easy to define, and some authorities are doubtful about it.

There is no doubt that any of them may be met with apart from rickets, but it is equally certain that when they occur in children between six months and three years old, undoubted rickety changes are almost invariably discoverable, although often not severe in degree. While, therefore, we

admit that the exact degree to which rickets acts in their causation is as yet undefined, it seems justifiable as well as convenient, in the meantime, to describe them as nervous complications of that disease.

Of these four nervous symptoms, facial irritability and convulsions are very common, laryngismus rather less so, and tetany comparatively rare. They may all be present at once, any three or two may be found together, or any one of them may occur alone. Convulsions and facial irritability are frequently met with alone apart from the others, laryngismus less commonly, and tetany rarely so. There are several clinical features which are common to all of these neuroses, whether single or in combination.

1. They occur mainly between the ages of six months and three years.

2. They are all much more frequently met with in the earlier than in the later months of the year. This is probably owing to the cold winds which prevail in these months predisposing to their occurrence.

3. They occur mostly in children with slight but progressive rickets, and less in cases with advanced rickety changes.

4. Sources of reflex irritation, such as teething, constipation, diarrhœa, or acid dyspepsia, are very commonly found, and are probably important as secondary exciting causes of the nervous phenomena.

5. The most important treatment in all cases is that directed against the rickets, but cold douching, sedatives, and antacids are also very important as auxiliary measures.

"Late Rickets."—Occasionally after some weakening disease such as influenza, measles, or whooping-cough, a child of three or four years will begin to show marked signs of rickets for the first time; and a few cases beginning at

nine, eleven, thirteen, or even seventeen,[1] have been put on record. These cases are spoken of as "late rickets" or "rachitis tarda." It is generally thought that they are due to a recrudescence of rickets which had previously been present. Such pathological examination as has been made seems to prove that the condition is really one of rickets. It is certain, however, that the ordinary dietetic causes of rickets are generally entirely absent.

The treatment consists in careful attention to the digestion, which is often much affected, and to the diet, in improvement in the hygienic conditions, and in the cautious administration of tonics. Its result in cases that are at all severe is often unsatisfactory.

"**Fœtal Rickets.**"—The existence of real fœtal rickets is doubtful. The name has generally been used for cases which are now described as achondroplasia or osteogenesis imperfecta.

"**Acute Rickets.**"—A number of cases have been described as acute rickets. These are now held to have been mostly instances of infantile scurvy. Occasionally the symptoms of a case of simple rickets set in comparatively rapidly, but as a rule, if the onset is acute, the case is not an uncomplicated one.

Treatment

The prevention of rickets depends on the maintenance of the mother's health during pregnancy and on the provision of proper hygienic conditions and of suitable diet for the child.

The therapeutic indications to be observed in the case of a child who has rickets may be summed up as follows: He must have more fresh air and sunshine. His digestion

[1] See case published by Dr. Alex. James, *Scot. Med. and Surg. Journal*, Jan. 1897.

must be attended to, his diet regulated, and certain tonic measures used. Any severe symptoms or complications present are to be treated, and means taken to prevent and relieve bony and other deformities.

We shall consider briefly how these indications may best be met.

1. **Fresh Air and Sunshine.**—The child should be taken out of doors twice daily at least, and for as long as possible. In the case of the poor, it is often a good plan to have the baby left in the open air in his perambulator for the greater part of the day, provided the weather be at all suitable. He must of course be warmly clad, because a rickety infant, owing to his excessive sweating and general debility, is particularly liable to chills. If he cannot be taken out, the window should be left widely open, night and day, and he should be kept in the sunniest room available. When the parents' circumstances permit of it, a stay at the sea-side may be very beneficial.

2. **The Digestion.**—Before making any great change in the diet, or giving tonics, it is advisable to consider the state of the digestion, and if it is defective, to take means to improve it. A short course of soda, with rhubarb or with nux vomica and gentian, will often so strengthen the digestive power as greatly to enhance the efficiency of the dietetic treatment. A few doses of grey powder will sometimes be found to facilitate considerably the digestion of the increased fat in the food. Should diarrhœa and vomiting be present, it is, of course, important to stop them before beginning to give cod liver oil or otherwise increasing the fat.

3. **The Diet.**—In all cases the feeding of the child must be carefully regulated. It is important to see that his meals are reasonable in amount and digestibility, and are given at suitable intervals. The main thing, however, is to ensure

that they contain an adequate proportion of fat and proteid in such forms as are easily assimilated.

Should the patient be a young baby on the bottle, a wet-nurse's milk is the ideal treatment for him. Short of this, however, careful modification of cow's milk is often very successful. When the child is unable to digest the casein of cow's milk sufficiently for the necessities of his nutrition, the addition of raw-meat juice to his bottle is often a great advantage.

In the case of children during the second year of life, the first point, generally, is to see that enough milk is being given. Mothers who are otherwise sensible will often be found giving their infants less than half a pint of milk in the twenty-four hours, when they ought to be having at least one and a half or two pints. It is also important to see that the child is not having a large excess of bread, potatoes, and other starchy foods, and that his digestion is not being upset by frequent mouthfuls of "whatever is going." Oat-flour or well-boiled oatmeal porridge, or some such preparation as Chapman's wheat-flour, should be given in preference to arrowroot or cornflour, and a little cream should be given with them. Yolk of egg, either beat up with milk or given in some other way, is almost always good for the child. It provides both proteid, fat, and organic combinations of phosphorus. The regular administration of cod liver oil in moderate doses is advisable in most cases. It may be given either plain or in emulsion (F. 22 and 23).

4. **Tonic Measures.**—Cod liver oil often seems to act as a tonic as well as a food. The value of alkaline tonics in improving the digestion has already been referred to. Iron is occasionally very useful if anæmia be present. Often, however, it only upsets the digestion, and generally it is unnecessary because the condition of the blood rapidly improves as the rickets passes off.

Uncombined phosphorus has been strongly recommended by Jacobi and Kassowitz as having a sort of specific action in rickets. Although others have found it less useful, it is certainly sometimes of considerable advantage if given with care so as not to disturb the digestion. It is usually administered dissolved in cod liver oil, but it may be given separately (F. 24 and 25). About $\frac{1}{200}$ grain may be taken thrice daily after food. Phosphorus combined in the form of mineral phosphates has long been known to be of no value —these salts being passed unchanged in the motions.

Cold douching does a great deal of good in most cases of rickets (p. 563). It is specially indicated in cases where there is great muscular feebleness and where any nervous symptoms are present. It has a strongly tonic effect on the circulatory and nervous systems. The frequent use of cold water in this way has the great advantage that it renders the child much less susceptible to cold, and thus enables him to be more freely exposed to the open air without taking chills. Persevering massage of the limbs and also specially of the back and chest muscles is of great value.

5. **Treatment of Symptoms and Complications.**—It is always to be remembered, with regard to the symptoms and complications of rickets, that their main treatment is that of the diathetic condition, and that the local treatment is only of secondary importance. Thus we find that profuse sweating, laryngismus and convulsions, sleeplessness and restlessness, digestive disturbances, loss of appetite, constipation, and bronchial catarrh, are generally all rapidly and permanently improved when thorough antirachitic treatment is carried out—even if no special measures are taken.

It is often, however, desirable to make use of local treatment also. If the sweating is severe, it may sometimes be benefited by oxide of zinc (grs. i to ii). When laryngismus and convulsions recur, antipyrine (grs. i to ii), or bromide of

potash (grs. ii to iv) may be useful. In these cases it is generally well to use cold douching also once or twice a day, as its effect is often markedly beneficial. The ordinary treatment of digestive and respiratory disorders should, of course, not be neglected.

6. **Prevention and Relief of Deformities.**—We have to remember that while rickets softens the bones and the ligaments, it does not bend or stretch them. That is done by mechanical forces acting in various directions on the softened parts. While, therefore, we are trying to arrest the rickety processes which are softening the bones, we must not forget to prevent, as far as possible, all postures and actions on the child's part which tend to produce deformities.

He must not be allowed to sit up for long, for fear of the development of kyphosis. If he is very rickety, he had better, at first, be kept lying on a pillow and not allowed to sit up at all. His nurse must not carry him always on one arm, lest he develop scoliosis; and any tendency to assume undesirable attitudes habitually must be checked.

It is, of course, very important to prevent the patient's attempting to stand or walk while the bones are still soft. Returning health is apt to bring with it a desire for more active exercise than can safely be allowed; and, if care be not taken, bow-legs, knock-knee, and flat-foot result. The application of lateral wooden splints, reaching from the thigh to four inches below the sole, is very useful, because these entirely prevent the child's standing. No form of steel or other apparatus which permits the child to walk about is of much value in preventing the bending of the limbs.

Rickety deformities of the thorax have a striking tendency to lessen as the child grows older and stronger. This improvement can be much accelerated and increased by the persevering use of dumb-bells, and by various other exercises of the arms and trunk.

Achondroplasia (*Chondrodystrophia Fœtalis*)

Achondroplasia is a fœtal disease in which there is "an absence, arrest, or perversion of the normal process of endochondral ossification of the most definite and universal character in every element of the skeleton in which the process normally takes place in intra-uterine life."[1] The morbid process which causes this interference with ossification is believed to run its course between the third and sixth months of fœtal life. At birth, accordingly, we find only the results of past disease, and not an advancing process as in congenital syphilis or cretinism.

The cause of achondroplasia is absolutely unknown, but it has been observed that the disease is occasionally found in several members of a family, or in a mother and child.

There are various degrees of severity of the disease. If the child is profoundly affected, hydramnios is often present and the labour is generally premature. In such cases, if the baby is born alive, he is usually so weakly that he dies within a few days. Should he, however, be stronger and survive early infancy, the subsequent development of his muscular, cutaneous, and reproductive systems is quite normal, and his intellect is unaffected. The chances of a long life in these children are probably as good as those of an ordinary individual — except in the case of women who become pregnant.

Clinical Features.—The deformity met with in this disease is very characteristic, the most striking thing about it being the disproportion which exists between the size of the trunk and that of the limbs (Figs. 136 to 139). The trunk is of normal length, but narrow from the shortness of the ribs and the contraction of the pelvis. The arms and

[1] Symington and Alexis Thomson, *Lab. Rep. Roy. Coll. Phys. Edin.* vol. iv., 1892, p. 238.

legs are markedly shortened. In adults they are often little more than half the normal length. The bones are thick as well as short, with very broad epiphyses. They are curved, the curves representing merely exaggerations of those normally present. The limbs are often surrounded by deep sulci, as if the skin and soft tissues

FIG. 136.—Achonodrplasia. Still-born infant. (Dr. Rainy's case.)

FIG. 137.—Achondroplasia. Girl aged 4 years.

were on an ampler scale than the length of the bones required.

The hands are almost always peculiar and characteristic.[1] They are relatively broad and very short. The fingers are thick, short, and rather conical. The individual digits are

[1] John Thomson, *Edin. Med. Journ.*, June 1893.

often all about the same length. The most striking peculiarity, however, is the want of parallelism in the fingers. When the hand is laid flat, so that the palm is not hollowed, they spread out in such a way that their ends are separate from one another and not close together as in a normal hand. The index and middle fingers usually curve to the radial, the ring and little fingers to the ulnar, side. For this condition the term "trident hand" has been suggested.[1] The reason of this deformity is difficult to explain. It recalls the shape of hand seen in certain gorillas.

The shortness of the lower limbs gives the child a peculiarly waddling gait, and soon after beginning to walk he develops a deep lordosis, which increases as he grows older.

Fig. 138.—Achondroplasia. Hand of boy aged 5 months.

It is important from a clinical point of view to remember that slight atypical cases of achondroplasia are occasionally met with. In these, while the deformity of the legs and back is characteristic, that of the arms is slight or even apparently absent altogether. In other cases the arms are long and well grown, but the hands are characteristically dwarfed.

The head is of fully normal size, the cranium being high and bulging in front and at the sides. The root of the nose is generally, although not always, depressed, owing to shortening of the basis cranii. At birth the tongue often protrudes from the mouth, but this is not a feature of the disease in later life.

Diagnosis.—*At birth* the deformity described above forms a picture which is easily recognised. The appearance of these infants has often been termed "cretinoid," and aptly enough, because they are certainly like cretins in several

[1] Pierre Marie, *Presse Médicale*, 14 Juillet, 1900, p. 21.

particulars. It is to be observed, however, that the likeness is to adult cretins, and not to cretin babies. In infancy, even, severe cases of sporadic cretinism do not present much disproportion of the limbs and trunk, nor yet the typical physiognomy of the disease, except to a very slight degree (p. 441). The thyroid of the achondroplasic child is usually felt distinctly, and he does not develop supraclavicular

FIG. 139.—Achondroplasia. Boy aged 5 months.

swellings. On inquiry, it will usually be found that the child with achondroplasia has cut his teeth early, and was not late in learning to walk; while rickety dwarfs have almost always been very backward in both these particulars.

It may be mentioned that the typical achondroplasic adult differs from the rickety dwarf in having all his limbs equally shortened, and especially in the characteristic de-

formity of his hands. He also presents a striking absence of rickety distortion in the spine, limbs, thorax, and head.

Older achondroplasics may be readily distinguished from cretins by the normal temperature and texture of their skin, their muscular and intellectual vigour, and the natural development of their sexual organs.

No treatment has any effect on the disease. The administration of thyroid substance is not only of no value, but may even do harm. In one case which was under thyroid treatment for a long time during adolescence, the bending of the legs seemed aggravated by the treatment, somewhat as happens in adolescent cretins.

Cleido-Cranial Dysostosis [1]

This is a peculiar and rare congenital abnormality of unknown origin which affects certain of the bones which are normally formed in membrane. It is characterised by a defective development or absence of the clavicles, so that the shoulders can be readily brought forward so as to touch in front, and by a delay in the closure of the fontanelle, which may remain open till late in adult life. The vault of the cranium is relatively large, the base shortened, the frontal and parietal bosses prominent, and the occipital region flattened. The bones of the face, including the lower jaw, are small and the palate abnormally arched. Other defects of the osseous system, such as scoliosis, knock-knee, and club-foot, are sometimes present.

The muscles and other soft tissues are unaffected. The mental condition is normal and the general health good. The condition is often hereditary, and several members of a family may be affected.

Treatment is, of course, out of the question.

[1] Marie and Sainton, *Soc. méd. des hôp.*, 1897 and 1898 ; Schorstein, *Lancet*, Jan. 1899, p. 10 ; G. Carpenter, *ibid.* p. 13.

FIG. 140.—Osteogenesis Imperfecta. Girl aged 2½ months.

FIG. 141.—Osteogenesis Imperfecta. Skiagram of lower limbs of same child.

Osteogenesis Imperfecta (*Fœtal Rickets*)

This is the term most generally used now to denote a rare intra-uterine disease the subjects of which are usually still-born, although occasionally they survive and live till adult age.[1] Cases of the condition have often been described as intra-uterine or fœtal rickets, as fragilitas ossium or osteopsathyrosis, or as a variety of achondroplasia. No cause for the condition has been discovered. I have known of three cases occurring in one family.

At birth, the children show very defective ossification of the cranial vault, large areas of which remain membranous for months. Generally there is marked bending (Figs. 140 and 141), and sometimes fracture with callus formation of the long bones. If the children survive, the fragility of the bones may persist, and they may suffer from frequent fractures on very slight occasion. These fractures recover without difficulty under ordinary treatment. The growth of the bones is much interfered with by the disease. In the only three cases which I have had the opportunity of watching for a period of years, there has been extreme dwarfing.

No medical treatment has proved of any value.

Multiple Exostoses

The occurrence from time to time of exostoses in various situations is an interesting condition which is sometimes mistaken for other things (syphilis, rheumatism, etc.). They appear mostly on the bones of the extremities, near their epiphysial lines, and they come at a time when rapid growth is taking place. The age at which they most frequently begin is between ten and twenty years, and they cease appearing when the growth of the skeleton comes to an end.

[1] P. W. Nathan, *Amer. Journ. of Med. Sci.*, Jan. 1905, p. 1 ; J. S. Fowler, *Edin. Med. Journ.*, Jan. 1906, p. 55.

They are distinctly hereditary, and are due to a defect in the development of the bones.

When the exostoses develop there is sometimes a degree of pain and tenderness complained of, but any symptoms that are produced are generally due to the pressure the exostoses exert on the neighbouring soft tissues.

When the growths are not pressing on any tissue so as to do harm, and are not interfering with the use of the limb, they should be left alone, as their removal is often difficult. If they are pressing on nerves or blood-vessels, an operation may become necessary.

CHAPTER XXII

ON INFANTILE SCURVY, RHEUMATISM, LITHÆMIA AND SYPHILIS

Infantile Scurvy (*Barlow's Disease*)

Scurvy is not a very common disease in infancy, but it is a very important one, because it is so readily amenable to proper treatment, and, when untreated, so apt to end fatally.

Definition.—"Infantile scurvy is an affection characterised by marked anæmia and severe pains referred to the bones. Anatomically, its essential characteristic is the presence of subperiosteal hæmorrhages situated mainly round the bones of the lower limbs. During the period before dentition, the hæmorrhages may be confined to the subperiosteal regions, but after the eruption of the teeth we meet, as in the scurvy of adults, with ecchymoses of the gums; these, however, are generally less important. That which distinguishes infantile scurvy from other forms of anæmia is its immediate arrest under the influence of fresh milk and the juice of vegetables and fresh fruit" (Barlow [1]).

As in the case of rickets, the affection of the bones constitutes the most characteristic lesion in this disease, but the less striking manifestations (anæmia, slight hæmorrhages, pains, etc.) which precede the subperiosteal hæmorrhages

[1] Art. "Scorbut Infantile," *Grancher and Comby's Traité des Maladies de l'Enfance*, 2me ed. t. i. p. 903.

are of great importance in indicating its presence during the early stages.

Dr. Cheadle was the first to draw attention (in 1878 [1]) to the real nature of cases of infantile scurvy, and in 1883 Sir T. Barlow [2] confirmed his opinion in a very thorough paper, in which he gave an account of several post-mortem examinations, and proved that these cases were due to a combination of rickets and scurvy; scurvy being the essential, and rickets a variable element. On the Continent, infantile scurvy is generally spoken of as "Barlow's Disease."

Clinical Features.—Infantile scurvy is most frequently seen in children between six and fourteen months, but it may (rarely) occur as early as four months, or as late as two years old.

Owing to the very important part played in its causation by proprietary articles of food, it is rarely met with among the very poor, and is chiefly seen among the middle and upper classes. For the same reason it is mainly a disease of large towns, and is found chiefly where hand feeding is frequent and fresh milk difficult to obtain.

Symptoms. — The most characteristic symptoms of infantile scurvy, being due to hæmorrhage, generally come on suddenly. They do not, however, set in in the midst of perfect health. Their appearance is preceded for some weeks by a cachectic condition, which is characterised by gradually increasing *listlessness and debility*, with disinclination for movement. The child is anæmic, and in severe cases has a peculiar *sallow earthy tint*; he is short of breath on exertion, refuses his food, and is exceedingly *irritable*. At this time also there may be *tenderness on movement* and pressure, especially of the legs and feet—much

[1] *Lancet*, Nov. 16, 1878.
[2] *Trans. Roy. Med. and Chir. Soc. Lond.*, 1883.

more than would be accounted for by the rickets, which is almost invariably also present.

If no change is made in the child's diet and surroundings, *pseudo-paralysis* of one of the lower limbs will probably develop more or less suddenly. The infant ceases to move the affected limb, and screams if it is touched. There is some swelling over one of the bones, usually the femur, accompanied by extreme tenderness. The skin is tense and shiny, and there may be some œdema. The joints are unaffected, and there is no local or general rise of temperature in uncomplicated cases. This condition is due to the occurrence of a *subperiosteal hæmorrhage*. In severe cases there may also be crepitus, owing to *separation of the epiphysis*, or, very rarely, to *fracture* of the shaft. Much less commonly, the subperiosteal hæmorrhage takes place in the upper limb, on the pelvis or scapula, or on one or more ribs. Rarely, it occurs *under the dura mater*; more frequently *inside the orbit*, and in this situation it causes a marked *protrusion of the eye* (Fig. 142). In addition to the subperiosteal hæmorrhages, there may be effusion of blood and serum *among the muscles*. The affection of the limbs tends to be symmetrical, that of one side following shortly after that of the other.

Along with the subperiosteal hæmorrhages, and often before them, *cutaneous ecchymoses* occur. These often have the appearance of ordinary bruises, and they are very readily produced. The vaccination scar is a common site of ecchymoses. Another situation where they are early met with is over the lower margin of the orbit, where they are probably caused by the ordinary process of washing and drying the child's face. Sometimes there are ecchymoses in the conjunctiva, and there may be marked *œdema with ecchymosis of the eyelids* and of the orbital tissues generally, causing great protrusion of the eyes.

The gums are usually pale at first. On close examination, however, small submucous hæmorrhages may often be

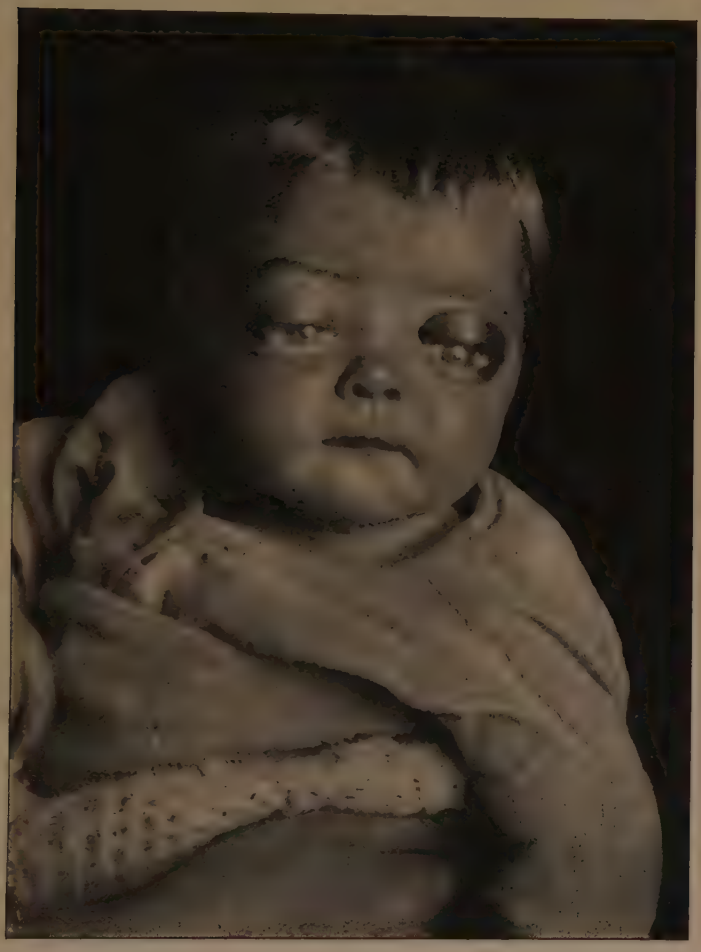


Fig. 142.—Infantile Scurvy. Girl aged 12 months. Showing proptosis, and ecchymosis of the orbits.

found on them, and later they tend to become spongy, swollen, and ulcerated. The degree of *sponginess of the gums* varies with the number of teeth that have appeared. If

there are no teeth, or only one or two, there is usually no sponginess. If there are many, it is very marked.

Occasionally, *epistaxis* occurs, and sometimes a little blood is passed from the *bowel.* Diarrhœa, with green slimy motions, is common. The *urine* nearly always contains a little blood, sometimes a large quantity, and, in rare cases, hæmaturia may be the only striking symptom of the disease present. The blood in the urine apparently comes from the kidneys, as, where the hæmorrhage is profuse, quantities of blood casts are found. *Pyelitis* occurs occasionally in scorbutic children, and when pyuria is discovered in infancy, an investigation into the possible presence of scurvy should always be made.

When scurvy occurs in children more than two years old, the symptoms resemble those in adults; subperiosteal hæmorrhages being much less likely to occur, and the spongy condition of the gums a more prominent symptom.

Etiology.—In children, as in adults, the main cause of scurvy is the prolonged use of a diet deficient in anti-scorbutic qualities—although what these qualities are due to is not as yet fully understood. There must, however, also be some important auxiliary causes which predispose the child to take the disease, for there can be no doubt that the ordinary scurvy-producing diets cause the disease only in a small minority of the children who take them. It is also important to remember that scurvy only results after the defective diet has been persevered with for a long time. In infants the period necessary to cause it is rarely less than five and usually between six and nine months.

The commonest causes of scurvy in young children are *condensed milk* and the *proprietary foods.* Scarcely less important is cow's milk which has been subjected to prolonged heating. When fresh cow's milk is just raised to boiling-point, it does not appear to lose its anti-scorbutic

properties to any great extent. When, however, the milk is *sterilised by boiling* for twenty minutes or more, its prolonged use is very apt to cause scurvy. Milk which has been carefully pasteurised, though not nearly so likely to cause the disease as that which has been boiled freely, is yet occasionally capable of doing so. Recently it has been pointed out by Heubner and others [1] that there is special danger of scurvy arising from the use of milk which has been twice sterilised. This is apt to happen when dairy companies sterilise or pasteurise their milk without telling their customers. The milk is then sterilised a second time before the baby gets it, and is found to have lost much of its anti-scorbutic property. The peptonising of milk also greatly lessens its anti-scorbutic qualities. Scurvy scarcely ever occurs in infants on the breast, except in cases where the mother herself is suffering from the disease.

In older children, scurvy is met with occasionally, and is especially apt to occur towards the end of prolonged cases of chronic diarrhœa. In these, what little milk is given is generally sterilised, and vegetables, including potatoes, are stopped, so that the diet becomes very defective in anti-scorbutic properties.

Diagnosis. — A well-marked case of infantile scurvy is easy to diagnose. In slight atypical cases, however, especially when the patient is suffering at the same time from another disease, the condition is very apt to pass unrecognised.

The possibility of scurvy being present is *always* to be kept in mind whenever a child has been confined for more than four months to a diet lacking in fresh elements. On the other hand, if the food has contained plenty of fresh

[1] Heubner, *Berlin. klin. Wochenschr.*, 1903, No. 13; J. A. Coutts, *West London Med. Journ.*, April 1906, p. 82; G. A. Sutherland, *British Journ. of Children's Diseases*, May 1906, p. 229.

material and raw milk, scurvy may be entirely put out of the question, even though the symptoms present seem almost typical of that disease. Another important point is that in all cases of scurvy there is distinct irritability, cachexia, and debility. If these are not present, it is not a case of scurvy.

Marked tenderness of the lower limbs, especially of the feet, without any obvious cause, should always arouse a suspicion of scurvy. If blood corpuscles are also found on microscopical examination of the urine, this may be held practically to complete the diagnosis—provided, of course that cachexia and a history of prolonged improper feeding are present. The rapid and permanent improvement which always follows anti-scorbutic treatment affords a complete confirmation of the diagnosis.

The morbid conditions for which infantile scurvy is most apt to be mistaken are fracture, tumour, and abscess of the thigh, infantile paralysis, and rheumatism.

Treatment.—The treatment of infantile scurvy consists in substituting for the child's defective diet one containing as large a proportion as possible of the anti-scorbutic element, and which is suitable to his age.

For young infants, the *milk of a suitable wet-nurse* forms the best diet. For most cases, however, *properly prepared cow's milk* does very well, and it must not be sterilised. It is a striking fact that scorbutic infants, though they have been markedly dyspeptic hitherto, can usually digest raw cow's milk quite well, even if it is undiluted. If there is any difficulty in its digestion, citrate of soda should be added (p. 546). All tinned foods must, of course, be stopped.

Orange juice should be given in doses of one or two teaspoonfuls twice or thrice daily, and if this cannot be obtained, lemon juice may be substituted for it. *Potato pulp* is strongly anti-scorbutic, and a teaspoonful may be given

twice a day in milk to infants of nine months and upwards. *Raw meat juice* may also be given, but it is not nearly so strongly anti-scorbutic as fruit juice or potato. In older children, *sieved vegetables* are very useful.

The result of such anti-scorbutic diet is exceedingly striking, and the improvement generally begins within a day or two of its commencement. The appetite and vigour return, the hæmorrhages cease, and the effused blood is rapidly absorbed; the gums assume their normal appearance; within a few weeks, in simple cases, the child is practically well. In some children with defective digestion, the symptoms tend to recur. This, generally, if not always, is due to the sterilisation of the milk having been continued.

In addition to the alteration of the diet, *tonics*, especially cod liver oil and iron, may sometimes be given with advantage, although they are often not necessary; the hygienic conditions must, of course, be attended to.

On the Diagnosis and Treatment of Rheumatism in Children

Many of the older authorities on the diseases of children have written of rheumatism as a rare disease in early life. This view, however, is no longer held; and, owing largely to the work of Barlow, Cheadle, Lees, and other English writers,[1] it is now recognised that it is not only a common condition in children, but that its manifestations are more characteristic, more varied, and generally more severe in them than in adults. True rheumatism does not, indeed, ever occur in early infancy, being practically unknown during the first two years; but from three or four onwards it is increasingly frequent, and it is probably commoner about ten

[1] Barlow, *Brit. Med. Journ.*, Sept. 15, 1883; Cheadle, *The Rheumatic State in Childhood*, London, 1889; Lees, *Allchin's Manual of Medicine*, 1900, vol. i. p. 291.

or twelve than at any other age. In a considerable proportion of the cases there is a family history of the disease.

Symptoms. — The manifestations of rheumatism in children vary in an interesting way from those in older people. In adults, the characteristic clinical picture of an ordinary acute rheumatic attack is that of a very painful polyarthritis associated with a considerable degree of fever and with profuse acid perspiration, and liable to be accompanied by various complications, especially in connection with the heart. In children, in fully one-half of the cases of rheumatism there is no joint affection at all; and when any is present it is often very slight in degree. There is generally little or no fever, and profuse perspiration is scarcely ever noticeable. The other manifestations of the disease, however, are much more often met with, and much more common, in children than in adults. Heart lesions are especially frequent and severe, and the occurrence of nodules, of chorea, and of erythema is very common.

The characters and diagnosis of rheumatic *arthritis* in children have been dealt with elsewhere (p. 71).

The *heart* is more frequently implicated by rheumatism in children than in adults, and indeed rarely escapes altogether, although often its affection is only slight and temporary. It must always be carefully watched, as the prognosis of the case depends mostly on the extent and character of the cardiac lesion, if present. It is characteristic of childhood that the myocardium is very often damaged. If mild in degree, this affection may lead only to a slight temporary dilatation of the heart, with increase of its dulness to the left, some impurity of the first sound at the apex (or a systolic murmur), and accentuation of the pulmonary second sound. If severe, serious and permanent dilatation may result. Endocarditis, usually of the mitral valve, is also very common. It occasionally seems to be

entirely recovered from, but it often leads to permanent valvular defect. Pericarditis is generally one of the later manifestations, but sometimes it occurs in a first attack. It is usually associated with marked dilatation of the heart. Its onset is often insidious, and sometimes it is marked by vomiting. It is generally subacute in character and shows a tendency to recur. It is rarely associated with much effusion; and when fluid is present, it is not purulent.

Pleurisy is not a very uncommon symptom of rheumatism, and in some cases is the first to appear. Like rheumatic *pneumonia*, it is more frequent on the left than on the right side.

Tonsillitis sometimes accompanies and often precedes other rheumatic manifestations. It is indistinguishable, except by its complications, from the non-rheumatic forms of the disease.

Chorea is certainly to be regarded as a manifestation of rheumatism in a large proportion of the cases, although in many it seems to have nothing to do with this disease. It is, indeed, well to regard every choreic patient as probably rheumatic, and to be ready to treat him accordingly (p. 362). The chorea is not seldom the first of a series of rheumatic phenomena.

Hyperpyrexia, which is such a grave symptom in adults, is almost unknown in the rheumatism of children; and Langwill has pointed out[1] that in the extremely rare instances in which it has been reported, the other symptoms have always been markedly of the adult type.

Skin eruptions of various kinds, especially erythema circinatum and urticaria, are often present in acute cases, and indicate an active state of the disease. Erythema nodosum is not a rheumatic condition in the same sense as these others are, although it is certainly sometimes met with in

[1] *Scot. Med. and Surg. Journ.*, Jan. 1899, p. 39.

rheumatic subjects (p. 183). The relation between purpura and rheumatism is also somewhat difficult to define.

Rheumatic nodules are an extremely important manifestation of the disease from a diagnostic point of view. They not only indicate the presence of rheumatism, but show that the disease is present in a serious and progressive form, and that active anti-rheumatic treatment should at once be adopted. They are to be found in a considerable proportion of rheumatic attacks in children in this country, but they are said to be much less common on the Continent and in America.

FIG. 143.—Rheumatic Nodules on Elbow.

The nodules vary from the size of a pin's head to that of a pea, or even larger (Figs. 143 to 146). Generally only a few are found at a time, usually over the bony prominences of the elbows, knees, or ankles, but occasionally they are present in large numbers, growing not only about all the bony prominences of the limbs, over the vertebral spines and under the scalp, but also on the ribs, clavicles, scapulæ, and iliac crests, and over the prominent tendons of the extremities and the fasciæ of the erector spinæ and abdominal muscles —even, rarely, on the rims of the ears. They appear in crops, lasting usually a few weeks, sometimes several months,

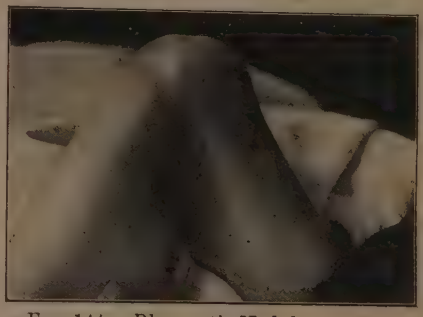


FIG. 144.—Rheumatic Nodules on Knee.

FIG. 145.—Rheumatic Nodules on Auricle.

FIG. 146.—Rheumatism and Chorea. Hair cut to show Nodules on Scalp.

and rarely more than a year. I have, in one case, watched several nodules for more than eighteen months before they disappeared. The skin over the nodules is not reddened, and is not adherent to them. They are, however, somewhat loosely attached to the periosteum or other fibrous structure over which they lie. They are not at all painful or tender to touch except when they are growing rapidly in tense structures, such as the scalp and palm, or have been irritated by pressure. When present, they are easily found if carefully looked for; and if the skin be moved over them in a good light, they are even more easily seen than felt. Occasionally nodules are present in very large numbers, as in the boy represented in Figs. 143 and 144, in whom more than two hundred were frequently counted at one time in different parts of the body.

These nodules are homologous with those which often form on the valves and pericardium in acute rheumatism, and are products of a local rheumatic inflammation.[1]

Treatment.—*During the Attack.*—When a child is recognised to be suffering from acute or subacute rheumatism in any form, he should be put to bed between blankets at once, however slight his symptoms may be. If the bowels are not acting freely, a dose of castor oil or calomel should then be given. The diet should also be limited to milk, if the temperature be high; and when it falls, some farinaceous food and eggs may be added. If arthritis be present, the affected joints should be wrapped in cotton-wool. It is always well to begin salicylate of soda at once and to give it in full doses. I generally order grs. x for a child of eight or ten, combined with twice as much bicarbonate of soda every two, three, or four hours, according to the severity of the symptoms, and gradually diminish the frequency of

[1] Poynton and Still, "The Histology of the Rheumatic Nodule," *Trans. Path. Soc. Lond.*, 1899.

the doses as the symptoms improve. The effect of the salicylate must, of course, as already mentioned, be very carefully watched (p. 365).

If the heart be affected, even in the slightest degree, the child should be kept in bed for some weeks at least and the anti-rheumatic treatment continued. When he is allowed to go about he must still be kept under careful observation for several weeks longer, before he resumes his ordinary habits of life. If the cardiac affection be severe, rest in bed for months constitutes the most important part of the treatment (p. 247). Although fresh air is most desirable, it is essential in obtaining it to avoid the patient's being exposed to draughts of cold air, as these are very injurious to him.

During convalescence iron and other tonics and cod liver oil are indicated.

After the Attack.—A child who has suffered from one attack of acute rheumatism is always in great danger of having another. This danger can be very greatly lessened by watchful care and prompt action on the part of his relatives. In the first place, it is generally well that the child should, every month or so to begin with, take salicylate and an alkali in small doses for a few days as a precaution. If he have any muscular or joint pains, any sore throat, or any rise of temperature, he must go to bed at once and be seen by a doctor. A complaint of "growing pains" is to be taken very seriously. A dry climate is desirable, and an inland place is preferable to the seaside. The details of his life, especially those of his school life and holidays, should be carefully regulated by medical advice. If this is attended to, his chances of attaining adult life with an undamaged heart are very greatly increased.

Lithæmia

It is not necessary here to discuss the pathology of the condition which is usually called lithæmia. Its manifestations

are very common in childhood, as might be expected from the strong part which heredity plays in its causation. They are numerous and varied, and it is very important to recognise their nature.[1]

Symptoms. — In infancy, children with lithæmic tendencies are generally strong, firm, and active, and they often have a good colour. Mentally, they are apt to be precocious and somewhat irritable. As they grow older, they often become pale-faced and suffer from chronic intestinal dyspepsia. They are subject from time to time to a variety of ailments which have certain characteristics in common. These are that they tend to occur periodically, that they usually set in without any ascertainable dietetic cause, and that they often alternate with one another.

Any system of the body may be affected. Urinary symptoms, for example, are very common. In young babies renal colic is sometimes met with, and other signs of irritation from abnormal urine are frequent. In older children, enuresis or recurrent functional albuminuria may occur. Attacks presenting gastro-intestinal and nervous symptoms, and more or less resembling migraine, are not uncommon. In these we find nausea, vomiting, and gastric pains, which are not apparently due to errors in diet, and are little affected by medicine. They are sometimes accompanied by a high temperature and rapid respiration, and in severe cases they may be ushered in by a convulsion.

A common manifestation, and one the cause of which it is very important to recognise, consists in *extreme irritability of temper*. The patient, who may be ordinarily a docile and sweet-tempered child, becomes unmanageable and abnormally naughty. His attacks of passionate screaming may, indeed,

[1] See Dr. Rachford's excellent article on "Lithæmia" in Starr's *Text-book of the Diseases of Children*, 2nd ed. p. 94.

Fig. 147.—Eruption. Girl aged 3 months.

Fig. 148.—Fissured Lips. Girl aged 4 months.

Fig. 149.—Fissured Lips. (Mr. Stiles' case.)

Fig. 150.—Nasal Deformity, Fissured Lips. Boy aged 3 months.

be so severe as to be almost maniacal. Much unnecessary distress may be caused to the parents by the child's outbreaks, as they are apt to attribute them to sheer wickedness. The way in which such attacks yield to medicinal and dietetic treatment is often most striking and satisfactory.

Asthmatic symptoms of various degrees and eczema are common and often alternate with one another. Occasionally severe wry-neck and other forms of "muscular rheumatism" occur.

Treatment.—Careful regulation of the diet is the first thing called for. Overeating is especially to be avoided, and such things as pastry and sweets must be forbidden. Meat soups and butcher meat are inadvisable, except in small quantities. The diet should consist mainly of milk and cereals, and in older children fresh fruit and green vegetables may be added. A moderate amount of eggs, fish, and fowl is to be given. It is very important that the child should drink a considerable amount of fluid (plain water, aerated water, etc.). Plenty of exercise in the open air must be arranged for, and sitting in close rooms is especially to be avoided. Possible causes of reflex irritation, such as phimosis, adenoids, and constipation, are to be sought for and removed.

Judicious drug treatment is very useful. To begin with, in acute manifestations of the condition, a dose of calomel is generally indicated. Thereafter a course of salol or salicylate of soda should be commenced and continued for many weeks — sometimes for months. In babies, salol (gr. i) may be given after each nursing. In older children, salicylate of soda (grs. iii to iv) may be ordered three or four times a day between meals. Along with this, citrate of lithia (gr. i thrice daily for an infant), or bicarbonate of soda (grs. ii to v according to age), or citrate of potash (grs. iii to v) should be given.

On the Diagnosis and Treatment of Congenital Syphilis

Diagnosis—in Infancy.—In the majority of cases, infants who are the subjects of congenital syphilis are born without any marked indication of the disease. The presence of snuffling breathing may indeed, from the very first, give grounds for a diagnosis; but often, for the first three or four weeks at least, there is no way of recognising that they are other than healthy children.

When the symptoms do begin, there may be such a characteristic *rash* and such marked *snuffles* that the nature of the case can scarcely escape recognition (Fig. 147). In some cases, however, the rash though copious is not characteristic, or it may be obscured by being complicated by an ordinary erythema or eczema; and often it is so slight in amount as to be difficult to recognise at the time the child is seen. In these circumstances we are sometimes helped in our diagnosis by the *distribution* of such skin lesions as are present. The most characteristic situations for specific eruptions at this age are the eyebrows, the lips and chin, the anus and genitals, the thighs, and the palms and soles. Often a few little scaly brownish patches in one or more of these situations is all that can be found. If the palms and soles are reddish and shining, as if they had been brushed over with gum, and especially if there be any desquamation about them, this is suggestive of congenital syphilis. Onychia is not very rare (Fig. 151). The skin over the chest and abdomen is generally free from eruption.

Condylomata also are sometimes found round the anus (Fig. 159). They are a late symptom of infantile syphilis, and are often met with in children of one, two, or three years, or even older. Their occurrence is conclusive as to the specific nature of the case, but not as to its being

congenital; for they are rather more characteristic of acquired than of inherited syphilis.

Another most important indication of congenital syphilis in young babies which is not uncommon is the occurrence of so-called *syphilitic pseudo-paralysis* due usually to epiphysitis. This may occur in any of the limbs, and is often multiple. It is met with most commonly at the upper end of the humerus or at the bones near the elbow. It is noticed that the child never moves the affected limb voluntarily,

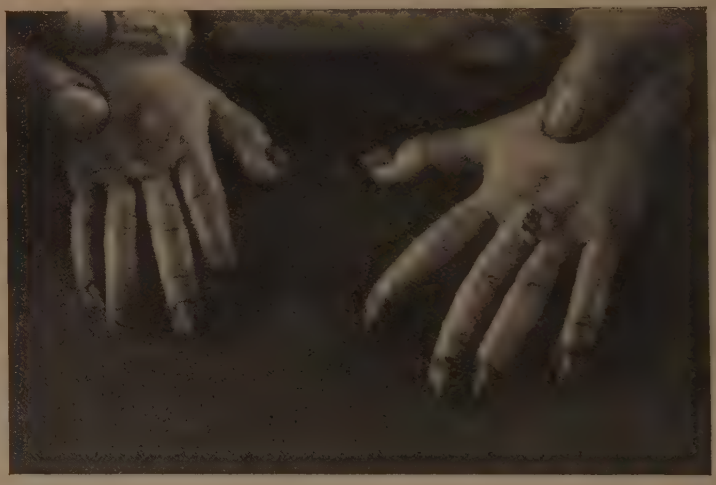


Fig. 151.—Congenital Syphilis. Onychia. Girl aged 16 months.

and cries when it is touched or moved for him. There may be little or no ascertainable enlargement of the affected bone. This condition occurs generally between the fourth and twelfth weeks of life. It may sometimes be met with apart from any other specific symptom, but it at once indicates the nature of the case.

In cases where the eruption and other early symptoms have passed off before the child is seen, the diagnosis is sometimes difficult. There are, however, a number of points,

varying in the degree of their significance, for which we must be on the look-out.

The child's skin is apt to be pale and sallow, and the complexion noticeably devoid of freshness. There may be brownish stains where former eruptions have been. There is often baldness, but sometimes the hair is longer and thicker in growth than usual, either all over the head or in places. Colman[1] has drawn attention to this, which he calls the "syphilitic wig." Great enlargement of the superficial veins,[2] especially those on the head, is sometimes seen (Fig. 152). A tendency to hæmorrhage in a cachectic infant is at least a suspicious circumstance.

Fig. 152.—Congenital Syphilis. Enlargement of superficial veins. Boy aged 6 months.

Our suspicions should always be aroused if in a young child we find thickening of the eyelids with loss of eyelashes (Fig. 153), or traces of iritis, or fissuring of the mucous membrane of the lips (Fig. 149), or, to a less extent, if there is obstruction of the nasal passages with atrophy of the alæ (Fig. 153). Severe fissuring of the lips and a marked degree of depression of the bridge of the nose (Fig. 150) are sure indications of the disease.

Bossing of the cranial bones when marked in degree (Figs. 31 to 33) suggests strongly the probable presence of syphilis;

[1] Robert Hutchison, *Lectures on Diseases of Children*, p. 82.

[2] E. Fournier, "Des dystrophies veineuses de l'hérédo-syphilis," *Revue d'Hygiène et de Médecine Infantile*, 1902, No. 1, p. 26.

and when this condition is met with along with evidence of a moderate amount of past hydrocephalus (Figs. 28 to 30), it is, I think, quite pathognomonic. Should the child's cry have a laryngeal or *hoarse character*, that is much in favour of his being syphilitic, and enlargement of the spleen points, although much less distinctly, in the same direction. Swelling of the testicles in an infant is not uncommon in syphilis, and is very rarely due to any other cause.

Fig. 153.—Congenital Syphilis. Loss of eyelashes, thickening of eyelids, and atrophy of alæ nasi. Same child as Fig. 147, aged 12 months.

It is important to remember that in some cases of congenital syphilis there is nothing to be discovered during life but *general wasting*. In these, the marked improvement which follows a few doses of grey powder may afford great help in the diagnosis.

In settling the diagnosis of a possibly specific case in an infant, it is rare to gain much from interrogating the mother as to her own symptoms. A history of specific symptoms may sometimes be obtained, but in many cases it is impossible to get an account of her having suffered from anything characteristic.

In Later Childhood and Adolescence.—In older children the presence of a congenital syphilitic taint is diagnosed (*a*) if traces of past syphilitic disease in infancy are found; (*b*) if the morbid condition from which they are now suffering is of an undoubtedly specific character.

Fig. 154.—Boy aged 10 years. Square forehead, keratitis, depressed bridge of nose, characteristic teeth.

Fig. 155.—Girl aged 16 years. Broad bridge of nose, fissuring round mouth.

Fig. 156.—Girl aged 14 years. Square forehead, phagedænic ulceration of nose, ear, and neck.

(*a*) *Traces of Past Syphilitic Disease.*—Many syphilitic children grow up showing no trace of their past specific ailments. The permanent alterations of the teeth, bones, etc., above mentioned, are only found in a proportion of cases, so that their absence proves nothing. The traces of past syphilitic disease which are most often found are the following:—

1. The characteristic deformity of the permanent teeth (Figs. 18 and 154). Its importance in diagnosis has already been considered (p. 52).

2. Absorption-patches in the choroid, situated usually towards its periphery.

Fig. 157.—Congenital Syphilis. Boy aged 7 years. Nodes on tibiæ.

3. Bossing of the head in older children, although often less distinct than that seen in young infants, is important. It consists mainly in a general thickening of the bone, which gives the forehead a heavy, square appearance (Figs. 30 and 33).

4. Depression or broadening of the bridge of the nose.

5. Fissuring of the lips and the adjacent skin (Fig. 155).

(*b*) *Essentially or Probably Specific Lesions.*—The most common of the morbid conditions which are so characteristic of congenital syphilis that their presence is suspicious, or even pathognomonic of the disease, are as follows:—

1. Interstitial keratitis, which in the great majority of cases is due to congenital syphilis (Fig. 154).

2. Sudden incurable deafness from disease of the internal ears.

3. The occurrence of periosteal nodes, tender swellings which are painful at night on the surface of one or more of the long bones—most commonly the tibiæ (Figs. 157 and 158).

4. The spontaneous occurrence of subacute or chronic synovitis of both knee joints, with considerable swelling and comparatively little pain or stiffness (Fig. 39). This is not uncommon in congenital syphilis, and is very rare indeed from any other cause.

5. Phagedænic ulceration of one of the mucous

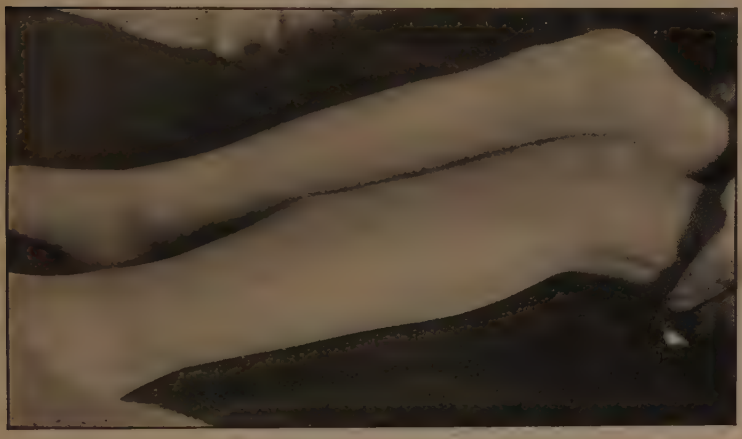


Fig. 158.—Congenital Syphilis. Girl aged 11 years. Nodes on tibiæ.

membranes, such as that of the nose, palate, or throat, or of the skin (Fig. 156).

6. Progressive dementia (see Chap. XIX.).

Treatment

For congenital syphilis **in infancy**, gr. ss to i of grey powder may be given thrice daily, according to the severity of the symptoms and the size of the child. Occasionally the dose may be increased to grs. ii. Solution of perchloride of mercury (B.P.) may be administered, instead of grey powder, in doses of ♏ x to xxx.

Mercurial salivation scarcely ever occurs in young children; but, in some, irritation of the bowels is apt to be caused. When this is so, bismuth and soda, or Dover's powder (gr. $\frac{1}{10}$ to $\frac{1}{2}$), may be added, or the mercury may be administered by inunction. For this, blue ointment is used, either pure or diluted with lard, in doses of from 10 to 20 grs. in the day. It may be rubbed alternately into the palms and soles, and into the sides of the chest, abdomen, and thighs, and it is usually advisable also to apply some of it on a flannel binder worn round the belly, so that the child's movements may favour its further absorption.

Mercury may also be used in the form of a bath (15 grs. of perchloride to 2 gallons of water), or hypodermically. Prof. Heubner[1] recommends the injection of one drop of 2 to 5 per cent. solution of perchloride into the gluteal muscles. This only requires to be repeated once in eight days.

The mercurial treatment must be persevered with as long as any specific manifestation is present; and it is generally advisable to continue some form of mercury in small doses, either continuously or intermittently, until the end of the first year.

Iodide of potash is only occasionally used in infantile syphilis, but may sometimes be required in obstinate cases, in addition to the mercury, especially when the bones and internal organs are implicated.

In **older children**, iodide of potash should generally be given. In pain in the bones, especially, it affords marked relief. Small doses of grey powder and inunction of mercurial ointment are also often useful.

At all ages, careful tonic treatment is of great importance in the later stages, and cod liver oil, iodide of iron, and other chalybeate preparations are often very useful. Dietetic and hygienic details must also be attended to.

[1] *Charité-Annalen*, xxx. Jahrgang.

Whenever it is at all possible, the mother of a syphilitic baby should be advised to nurse her child. The employment of a wet-nurse is not allowable, because, although infection of the nurse under such circumstances is extremely rare, it has been known to occur.[1] A number of cases have been observed in which a baby with congenital syphilis has infected another person. This occurrence is exceedingly uncommon, but it must always be borne in mind as possible.

FIG. 159.—Syphilitic Condylomata. Girl aged 2 years.

Acquired Syphilis.—This is occasionally seen in infancy and childhood, and its symptoms and treatment differ in no important respect from those of the same disease in adults.

The primary sore is most frequently found in the mouth or on the lips. This may be due to the infection having been communicated directly by kissing, but probably it arises quite as often from the child's indiscriminating habit of picking up all sorts of dirty things and putting them into his mouth.

[1] J. A. Coutts, *Some Aspects of Congenital Syphilis*, London, 1897, p. 110.

The symptoms, apart from the absence of snuffles, are very similar to those of the hereditary form of the disease. Condylomata are a prominent feature (Fig. 159). The acquired disease is, of course, very apt to spread by contagion.

CHAPTER XXIII

ON INFANT FEEDING

Breast Feeding

During the first seven to nine months of a child's life, he should draw his nourishment solely from his mother's breasts: and, till the end of the tenth or even twelfth month, if all goes well, the breast-milk should form the main part of his food. The mother's milk is the most digestible as well as the most perfectly nourishing food a child can have. When a delicate baby is deprived of breast-milk and put on the bottle, he is exposed to certain additional risks, and this should therefore never be done without careful consideration. If the child is strong, it is less important; but if he is specially weakly (*e.g.* atrophied, syphilitic), breast feeding may give him his only chance of life.

Unfortunately, however, there are circumstances which may arise to prevent the possibility or desirability of breast feeding. There are, for example, a large number of apparently healthy women who have *no milk* for their children. In other cases nursing may have to be forbidden, either because the *mother is so delicate* that the additional strain which it causes would be too much for her, or because she has *tuberculosis*, and the close contact which nursing implies would expose the baby to very serious risk of infection with that disease. Further, the mother may have to give up nursing owing to an *abscess of the breast*, cracked nipples, or some other local or general disease.

Nursing.—The new-born child should be put to the breast three or four times during the first two days. The small quantity of colostrum which he obtains is good for him as a laxative, and the process by which he obtains it is good for the mother, stimulating the uterine contractions and also conducing to the further secretion of milk. It is not necessary to begin feeding a healthy infant before the third day of life, but a few teaspoonfuls of boiled water may be given with advantage every two or three hours. Nature intends that his digestive organs should have a rest until the breast has prepared suitable food for their use. The administration of laxatives, carminatives, or other medicines at this time is also uncalled for, and usually does nothing but harm.

On the third day, and thereafter for four to six weeks, the breast should be given at regular intervals of two hours, except at night, when a sleep of four hours should be allowed, and this after the first month may be extended to six hours. After the first six or eight weeks, the intervals during the daytime may be lengthened to three hours. The three hours intervals may be continued while the child is at the breast, but as he gets older he will take a longer sleep at night.

Human Milk—its Composition and Characters

In considering breast-milk, we must bear in mind that it is a living fluid, and that in this it differs from the mere mechanical mixtures of food-stuffs with which we usually endeavour to supply its place. One result of this is its variation. Within certain limits, its composition changes considerably and frequently, even during the course of the day. Such variations do not disagree with the nursing infant. Probably they are good for him. As our digestive organs modify the character and amount of their juices according to the needs of the food taken, so it is probable that the mother's breast varies its secretion to some extent to meet

the wants of the baby. Thus, it is said that richer milk is yielded to the feeble efforts of a weakly infant than is usually drawn off by a strong baby. It has also been shown by Chapin[1] that the mother's milk has an important function in developing the digestive organs of the growing child so as to fit them for their future diet.

The normal variations of breast-milk, however, are strictly confined within certain limits, and it is of importance to know the average composition and characters of the fluid. In order to remember and appreciate these, it is best to compare them one by one with those of cow's milk, which are more familiar.

1. **Composition.**—The percentage composition of cow's milk and human milk may be roughly stated as follows (Holt):—

	Cow's Milk.	Human Milk.	Common Healthy Variations.
Water	86 to 87	87·30	89·82 to 85·50
Fat	4·00	4·00	3·00 ,, 5·00
Proteids	3·50	1·50	1·00 ,, 2·25
Milk sugar	4·50	7·00	6·00 ,, 7·00
Ash	0·75	0·200	0·18 ,, 0·25

The most important difference between the two kinds of milk lies in *the different character and amount of their proteid constituents.* In both, this consists mainly of casein and lactalbumin (which resembles serum-albumin). The casein is precipitated by acids and rennet and not by boiling—the lactalbumin by boiling and not by acids or rennet. In cow's milk, according to Prof. Leeds,[2] the casein is to the lactalbumin in the proportion of four to one, while in human

[1] *Med. Record*, Dec. 12, 1903, p. 921.

[2] "The Chemistry of Milk and of Artificial Foods for Children," Starr's *Text-book of the Diseases of Children*, 1894, p. 46.

milk it is only as one to two. The result of this (combined with the difference in the percentage of the proteids) is that, on the addition of dilute acid to the cow's milk, the greater part of the proteid is precipitated in the form of heavy cheesy masses.

Human milk when treated in this way gives a precipitate composed of a relatively small part of its proteid, and this is in the form of finely divided and therefore easily soluble flakes. Thus, if one takes "equal parts of the two secretions, the coagulum of woman's milk is but one-fifth as much as that of cow's milk." The total amount of the proteid constituent in cow's milk is from two to three times as much as that in human milk.

The percentage of *butter* in the cow's milk which is obtained in towns is very apt to fall below 4 and may be under 3 per cent. There is a certain amount of difference in the character of the fatty constituents in the two kinds of milk. That of human milk contains more oleic acid, has a lower melting-point, and is in a state of somewhat finer division.

While the quantity of *milk sugar* in the two differs, its composition is exactly the same in each. Cow's milk contains a much larger proportion of *salts*. Thus, for example, there is four times as much phosphate of lime in it as there is in human milk. It is also of considerable importance that while in human milk the great bulk of the phosphorus present is in the form of organic compounds, in cow's milk only about a half of it is thus combined.

2. **Reaction.**—Human milk is amphoteric or slightly alkaline to litmus.[1] Cow's milk, by the time it is available for feeding purposes, is always distinctly acid.

[1] Kerley, Gieschen, and Myers (*Med. Record*, Aug. 8, 1903) have shown that when human milk is tested by more delicate tests than litmus, it is found to be slightly acid.

3. **Sterility.**—Human milk is practically sterile as it leaves the nipple. Cow's milk, on the other hand, when delivered for use contains a very large number of bacteria.

4. **Antiscorbutic Properties.** — The milk of healthy women (like fresh cow's milk and unlike condensed milk) contains the antiscorbutic principle, so that infants fed upon it do not take scurvy.

Causes of Breast-Milk Disagreeing

Sometimes the breast-milk does not agree with the child. He either does not thrive as he should do, or he is uncomfortable and shows other signs of dyspepsia. This may be due to a variety of causes.

The mother may not be *attending as she ought to her own health or diet.* She may for some reason be over-anxious or excited, and this may interfere with the function of the breasts, so that the milk is quite abnormal in composition for the time. In such a case, with the restoration of mental tranquillity the milk will often recover its normal characters. Again, certain articles of diet cause the milk of some women to become temporarily unwholesome, and when these are discontinued it returns to its normal condition.

A very important and common cause is the *irregular and too frequent giving of the breast.* This is bad, not only because it gives the infant's stomach no rest, but also because, when the breasts are stimulated to secrete at too short intervals, the milk produced is abnormal and difficult of digestion. Milk secreted under these conditions contains an abnormally large amount of solids, especially of casein. If the intervals between nursing are too long, on the other hand, the milk is watery and unsatisfying.

Other causes connected with the *mother's usual diet and habits* may render the milk indigestible, by altering the proportion of its constituents. Thus there may be a great

increase in the proteids, or a diminution or excess in the quantity of cream. The amount of milk sugar rarely varies much.

Return of the mother's menstruation, while she is nursing, occasionally disturbs the baby, but as a rule the disturbance is slight, and, so far as the child is concerned, the nursing should not be discontinued on account of it.

Faults in the composition of the milk may, and often do prove incurable; but they can sometimes be remedied by diet and exercise. Provided the mother's diet has been previously insufficient, a larger amount of proteid food may increase the cream in her milk as well as its albuminous elements. Regular exercise also may do something towards diminishing an excess of casein in the milk, without affecting its other constituents.

If the mother has some milk in her breasts, but not enough to fully nourish the child, it is generally advisable for her to give what she has, and to supplement it by bottle feeding. What she can give is usually a gain to the child, and the secreting power of the breasts may increase with use.

Even although a mother has plenty of normal milk, it is a good plan to give the baby one bottle in the day. This is not only a welcome relief to the mother, but it accustoms the infant to the use of the bottle, and this may be an advantage afterwards should anything interfere with the continuance of the nursing.

Weaning

If the mother is strong and well, and the child thriving, it is advisable to continue the nursing for ten or even twelve months, although after the seventh month the breast-milk may require to be supplemented by some other food. The process of weaning should take place gradually, occupying

about three or four weeks, so that the infant's stomach may have time to accommodate itself to the change of food. Sometimes, however, the baby will utterly refuse the bottle so long as he gets any breast-milk, and in these cases it may be necessary to stop giving the breast at once and altogether.

Weaning should not, if possible, be carried out during very hot weather, owing to the special risks at such times of serious dyspeptic derangements.

Wet-Nursing

When the mother is unable to suckle her child, she must either get a wet-nurse or begin hand feeding. From a theoretical point of view, the former plan is the best; but, for various practical reasons, wet-nurses are rarely employed nowadays in this country for healthy children. They are not only difficult to find and expensive to keep, but the circumstances which induce them to offer their services are often such as to render them undesirable inmates of a house.

While wet-nurses can only occasionally be made use of, however, it must always be remembered that no form of artificial feeding, however skilfully planned and carefully carried out, is nearly so good for weakly children as suitable wet-nursing. Therefore, although wet-nursing is usually unnecessary in ordinary cases, many infants who are dying of atrophy, or from the exhaustion caused by severe diarrhœa or other disease, may be saved by wet-nursing and by nothing else. Where the infant is too weak to be able to draw the milk from the wet-nurse's breast, it should be drawn off for him by a breast pump and given through a bottle or with a syringe.

Hand Feeding

In practice, among vigorous country people in a cool climate and with healthy surroundings, the subject of the

artificial feeding of infants is one which requires but little trouble or thought. Among the anæmic and sickly inhabitants of towns, however,—even in this climate, and still more in warmer ones,—there are few more important problems than hand feeding. A large proportion of the young children met with in general practice are suffering from the results of improper feeding, and the regulation of their diet forms the main, and in most cases the only, necessary part of the treatment.

The art of hand feeding, in accordance with the latest scientific knowledge, is no simple matter; and the more the subject is studied the more perplexing are its endless intricacies apt to appear. While, however, there are certainly cases which call for all the science and art the physician can muster, in the vast majority of instances successful infant feeding depends simply on the careful carrying out of a few common-sense rules. When the baby is doing badly, it may be for want of more skilful planning of his diet. Far oftener, however, it is simply because the well-known cardinal rules as to cleanliness, regularity, moderation, and carefulness in details are being habitually overlooked or neglected.

The Feeding Bottle

The bottle used in feeding the child should be as simple in form as possible—a plain cylindrical flask with no angles in it. It should hold from eight to ten ounces, and it is an advantage to have it graduated in half-ounces. It should have no cork or tube connected with it, and should be provided with a plain conical rubber nipple which will fit over its neck and is wide enough to be easily turned inside out and scrubbed with a nail brush. The opening in the nipple should vary in size according to the strength of the child. Generally speaking, it should be large enough to

allow the milk to drop through it readily when the bottle is turned upside down, but not so large as to let it run from it in a stream. It is well to have two bottles and two nipples, so that they can be used alternately.

The bottles which have the nipple situated at the end of a long rubber tube, with a glass tube hanging inside, are in almost every way objectionable. It is practically impossible to keep them perfectly clean, and they encourage ways of feeding the child which are bad for him, however they may save the mother's time. A good form of bottle is that which has an opening at both ends, so that a stream of water can be run through it for cleansing purposes.

The Use of the Bottle

When feeding an infant from the bottle, the mother or nurse should sit down and give the same attention to the process as she would to that of suckling. The milk should be given at about the temperature of the body. The child should be allowed fifteen or twenty minutes for his meal, and then the bottle should be taken from him. Regularity in the times of the meals is nearly as important as in the case of breast feeding, and the intervals should be the same (p. 524).

When the meal is over, the bottle must at once be emptied and (with the nipple) cleansed thoroughly with soap and hot water, and put to soak in a saturated solution of boracic acid or a weak solution of permanganate of potash until required again. In hot weather, the bottle should be sterilised by placing it in boiling water for twenty minutes before it is used again. No milk which has remained for some time in the bottle should ever be given to a child; and it is important also not to allow a drop of milk to dry on the glass inside the bottle, as it is very difficult to remove thoroughly. The rubber teats should be frequently renewed,

as they are apt to get cracked, and then it is impossible to keep them thoroughly clean. The importance of keeping the feeding bottle free from sourness cannot be over-estimated. A single bottle of sour milk will often cause an attack of dyspepsia which lasts for weeks and may even end fatally.

The habit which some nurses have of putting the rubber teat to their own lips before giving it to the baby is *exceedingly dangerous*, and should never be permitted.

The baby *should not be allowed to suck the nipple of an empty bottle*, and the constant sucking of a solid indiarubber teat, which many nurses favour as a means of keeping the child quiet, should be discouraged as a bad habit. In certain exceptional cases, however, the temporary use of a contrivance of this kind may be of use in soothing an irritable child whose condition makes it imperative that he should be kept from crying (p. 351). If allowed, the teat must be frequently sterilised by boiling, and never allowed to fall on the floor while being used.

The **quantity** of milk to be given must vary to some extent according to the individual child, and if he is healthy it may be left a good deal to his appetite. It is well, however, to have some idea of the amount an ordinary child requires at different ages, because he may suffer from habitually taking too little; and, on the other hand, as happens much more frequently, he may be made ill by being given too much.

The following table gives what may be regarded as the minimum amount of *breast-milk*, or its equivalent, to be taken at each feeding and during twenty-four hours respectively, by an average infant at different ages. Strong, healthy children will often take larger quantities with

advantage. If the food given is much diluted, also, larger quantities will be required:—

Age.	At each feeding.	In 24 hours.
1 week	1 oz.	10 oz.
1 month	2 „	16 „
5 months	5 „	1½ pints
9 „	8 „	2 „

Choice of a Substitute for the Mother's Milk

Breast-milk is *the only perfect infant's food*, and it is by studying its composition and characters that we find out how best to supply its place. All the substitutes devised for it are but imperfect imitations of the original, and they are always apt to cause more or less indigestion or malnutrition at first. The more the food given approaches the mother's milk in *its essential particulars*, the less dyspepsia will it cause and the sooner will the child's digestion adapt itself to it.

When we come, however, to inquire which are the *essential* qualities of the breast-milk, we find that authorities hold widely different views on the subject. To some, human milk is, first of all, a food of a definite percentage composition, and its place can only be satisfactorily taken by a mixture which contains proteid, fat, and sugar in somewhat the same proportions as it does. To others, a close resemblance in the exact chemical and physical properties of the solids in the food—especially of the proteids—is the chief thing. To others again, milk is, above all things, a sterile fluid, and their main requirement is that its substitute should be thoroughly sterilised. Lastly, there are some who are chiefly impressed by the fact that milk is a "living fluid" subtly blended in Nature's laboratory; and the main thing, to their way of thinking, is that its delicate combinations should not be disturbed by diluting or heating or any other manipulation that can be avoided.

There is a good deal to be said in favour of each of these points of view, and though we cannot enter on their discussion here, it will be well to bear them all in mind while proceeding to consider what had best be given to the child if he has to be hand fed.

Fresh Cow's Milk

Fresh cow's milk is more used for infant feeding than all the other substitutes for breast-milk put together, and for most cases it is far the best of them. For ordinary purposes, the mixed milk of a good dairy should be used, as it is much more likely to be uniform in composition than "the milk of one cow." Although cow's milk is the best thing to use, however, it has been the usual experience that, when given unchanged to babies in the usual way, it is not well digested. It has, consequently, been the general habit in all countries to modify it in some way for the infant's use.

This modification has often consisted merely in diluting the milk, so as to lower the proportion of its proteids and salts, and in the addition of sugar. Sometimes cream has also been added, and the mixture sterilised. Or, again, more or less elaborate modification has been carried out, in the endeavour to produce a so-called "humanised milk" which should resemble the breast-milk as closely as possible.

There is still a considerable majority of authors (including the present writer) who regard modified milk as probably the best of all artificial substitutes for the mother's milk. Within the last fifteen or twenty years, however, it has been conclusively shown, mainly by Budin and other French physicians, that if pure cow's milk be sterilised, and if the quantity given be not excessive, it can often be thoroughly digested even by new-born children, and that many infants fed in this way thrive extremely well. It may also certainly be claimed that this method of feeding has great advantages in its simplicity.

We shall therefore describe its details briefly before proceeding to consider the modification of milk.

Undiluted Sterilised Cow's Milk[1]

Successful infant feeding with pure cow's milk can only be hoped for if the milk is not only sterilised but also strictly limited in amount. Failure to comply with these two conditions largely accounts for the want of success that has attended feeding with undiluted milk in the past.

The sterilisation which Budin recommended consists in heating the milk to 212° F. in a Soxhlet's steriliser for forty-five minutes.

The right amount of milk to give cannot be settled by the child's age, because children vary so much in size; nor by his weight alone, as the digestive power in infants of the same weight often differs considerably. The only satisfactory way to determine the matter is to begin with small quantities —about one-tenth of the child's weight in the twenty-four hours —(*e.g.* 10½ oz. divided into eight feeds for a child of 6½ lb., and 14 oz. for one of 9 lb.), and to be guided by the result. If the baby thrives and gains weight satisfactorily on this, no change should be made. If, however, he fails to gain as he should, the amount of milk must be cautiously increased until he does so.

Some infants cannot digest pure milk even under the above conditions. When this is so, Budin recommended the addition of a variable quantity of ordinary water, barley water, lime water, or other diluent, or the administration of pepsin before the bottle.

Budin claimed that children reared on pure milk, sterilised and administered according to his directions, never suffered from either rickets or infantile scurvy. So far as my

[1] Pierre Budin, *The Nursling*, translated by W. J. Maloney M.B., Caxton Publishing Co., London, 1907.

experience of this method (which has not been very large) has gone, it has been to the same effect.

Modification of Cow's Milk

We may now consider the details of modifying cow's milk one by one, and then see what combination of them is likely to give the best results.

Dilution.—Dilution with water, with the addition of sugar, is the mode of preparing cow's milk that was, for long, most widely used, and it often does fairly well for strong children with a good digestion. Mere dilution, however, makes a food which is very unlike human milk in its composition and characters.

The proportion of water to be used must depend upon the amount of casein the child is able to digest. Thus, during the first six weeks of life, two, if not three, parts of water to each part of milk must often be used, and this makes an undesirably weak mixture. After that, equal parts of milk and water till the fourth or fifth month; then two parts of milk to one of water till the eighth or ninth month; after this the strength of the mixture may be gradually increased until by the end of the first year the baby is taking pure milk.

The dilution of the milk with *barley water* or some other farinaceous or gelatinous decoction (see Appendix F), instead of with plain water, has been much used, and certainly milk so prepared is sometimes more readily digested. Barley water, as may be seen from its composition, is practically of no use as a nutrient.

Analysis of Barley Water (Wynter Blyth)

Water	99·27
Fat	0·02
Proteids	0·03
Starch	0·39
Sugar	0·05
Mineral matters	0·03

When it is being used, it is important to see that it is made at least twice a day, as it does not keep well, and, if sour, is sure to disagree with the infant.

Addition of Sugar.—The sugar used in infant feeding should, if possible, be milk sugar; but if reliable milk sugar cannot be obtained, white cane sugar does quite well. Brown sugar should not be used, as it is apt to cause dyspepsia and griping. The amount of milk sugar added should be sufficient to bring the percentage to about that of human milk: this is easily calculated approximately from the average analysis already given (p. 525). When cane sugar is used, rather less may be given.

Addition of Cream. — The great difficulty with regard to this lies in the degree in which various samples of cream differ from one another in the amount of butter fat they contain, and in there being no ready method of ascertaining their composition in this respect. Ordinary thin cream may contain from 8 to 20 per cent. of fat (average, 16 per cent.), while in the thicker samples the percentage may reach 35 or 40, or even more. In towns we may obtain centrifuged cream of a known composition; otherwise the amount of cream to be added to the child's bottle must be rather a matter of guess-work.

It is better, therefore, to use "top milk"—that is to say, the upper half, or third, or quarter, as the case may be, of a quantity of milk which has stood for a known number of hours in a cool place (*v. infra*).

Addition of an Alkali.—Lime water is the form in which the alkali is usually given, and as it only contains half a grain of lime to each ounce, it must be given in considerable quantity. In ordinary cases, where it is merely desired to modify the acidity of the cow's milk, from one-sixteenth to one-eighth of the mixture should be lime water. In certain forms of illness, in children as in adults, we may

have to give a much larger proportion of alkali in order to neutralise the acidity of the gastric juice.

A solution of bicarbonate of soda (1½ gr. to 1 oz.) may be used in place of lime water and in the same quantities, or about half as much fluid magnesia.

Sterilisation.— Normal cow's milk is a sterile fluid originally, but as it comes from the udder at the beginning of milking it contains a few micro-organisms which have found their way into the ducts. When treated as it ordinarily is in the process of milking, it rapidly becomes contaminated by organisms from the milker's hands, the cow's body and its various unclean surroundings, and soon—especially if is allowed to cool slowly—these multiply very rapidly. Thus, when the milk is obtained for feeding purposes it is found to be swarming with a variety of micro-organisms. It may contain tubercle bacilli, or it may convey the infection of enteric or scarlet fever or some other infectious disease. Apart, however, from the action of such pathogenic organisms, we find that there are many others in unsterilised milk which are apt greatly to increase the difficulty of its digestion and to give rise to many forms of dyspeptic disturbance. Professor Soxhlet found that calves a few days old got diarrhœa whenever they were taken from the udder and fed with their mother's milk out of a trough, and that this stopped when they were put back to the udder. Efficient sterilisation will in many instances enable even a delicate child to thrive on a milk food which is far from being suitable in other respects in its composition.

It is probable that in the future the practical results of bacteriology will come to exert a greater influence than at present in the ordinary dairy and dairy farm, and that a degree of care and cleanliness will then be introduced into their operations which is at present unknown. When that time comes, the habitual sterilisation of the milk used in infant

feeding may be unnecessary. In the meantime, it is certainly desirable that all ordinary milk used in feeding infants, in towns, should be carefully sterilised by boiling or steaming.

Boiling.—The simplest way of sterilising milk is to boil it in an ordinary pan over a fire or spirit lamp; but it is apt in this way to be burned. It is better, therefore, to place the milk in a porcelain vessel or glass flask inside a pan containing water, as overheating will then not be so likely to occur.

In the hands of cleanly and careful people, in a cool climate, this simple method of boiling the milk is quite satisfactory; and the apparatus is very inexpensive and easy to keep clean.

The supply of milk must of course be sterilised while it is fresh. If it is allowed to stand until it gets sour, no amount of boiling will render it wholesome. It should also, after boiling, be allowed to *cool rapidly*. It must also be very *carefully protected* from the air, and kept at a low temperature; otherwise it will rapidly become reinfected with micro-organisms.

Sterilisers.—In hot weather, and when great care in the handling of the milk cannot be guaranteed, it is best to use a regular steriliser. Of these there are many excellent forms; the two following may be described as typical.

Soxhlet's steriliser, which is the best known, consists of the following articles:—

1. A number of thin glass flasks.
2. A large covered tin pan in which these can be surrounded by water and boiled.
3. A tin holder for lifting the flasks into and out of the pan.
4. A wooden rack, with a zinc dripping pan, in which the spare bottles are placed, and which contains a drawer for extra corks, teats, etc.

5. A small double-bottomed tin mug in which the flasks are warmed before use.

6. A graduated glass beaker with a handle, for mixing the milk, water, etc., in the proportions required.

7. Rubber discs for closing the bottles, and small metal caps to hold them in position. (Sometimes perforated rubber stoppers are used, into which small glass rods fit.)

8. Rubber teats, and a few bristle brushes for cleaning the bottles.

Directions for Use.—Sufficient milk for the day's use is modified by the addition of cream, sugar, etc., and ten of the flasks are filled with it, up to within half an inch of the neck. The flasks are then arranged upon the holder, a rubber disc being put upon the mouth of each with a metal cap to keep it in position. The holder is placed in the tin pan, which is filled with cold water up to the level of the milk in the flasks. The cover is then put on, and the pan placed on the fire and allowed to boil for forty-five minutes. (If the rubber corks and glass rods are used, the former only are inserted at first, and after the water has boiled for five minutes the pan is taken off the fire and the glass rods put in.)

The pan is then taken off the fire, the lid removed, and the flask holder lifted out. As the flasks cool, the rubber discs are forced inwards by the atmospheric pressure, so that their upper surface becomes deeply concave, and the flasks are thus hermetically sealed.

When required for use, a flask is warmed to blood heat in the tin mug. The disc is removed by raising its edge a little, and one of the rubber teats is fitted on the neck of the bottle.

Soxhlet's steriliser is a very satisfactory one; it is easy to manage, and milk prepared in it will keep sweet for from four to six weeks.

Cathcart's steriliser (Fig. 160) consists of a cylindrical block-tin vessel, tapering slightly towards the base, which fits easily into an ordinary pan. It is furnished with a nickel-plated tap, through which the milk is drawn off. The lid fits tightly, and, when sterilisation is completed, the line of juncture between it and the can is rendered air-tight by slipping an elastic band over it. In the centre of the lid there is a funnel-shaped aperture, which is plugged with cotton-wool, and through which the handle of the stirrer projects. The stirrer consists of a metal rod to which a screw-shaped piece of tin is attached. Its lower end rests in a small depression on the bottom of the vessel, while its upper end reaches far enough beyond the top of the lid to be rotated by the forefinger and thumb.

Fig. 160.—Cathcart's Milk Steriliser.

Directions for Use.—The milk for the day is mixed and poured into the vessel, which is then placed in a pot about a quarter full of boiling water. The pot is kept boiling over a good fire for twenty minutes, at the end of which time the vessel is lifted out, the rubber band adjusted over the edge of the lid, and a plug of clean cotton-wool placed round the handle of the stirrer in the top of the funnel.

The vessel is set aside in a cool place, and each bottleful of milk is drawn off from the stop-cock as required, the contents of the vessel having been first thoroughly mixed by rotating the handle of the stirrer.

Cathcart's steriliser is a simpler and much less expensive apparatus than Soxhlet's. It is therefore specially adapted for use among the poor, and when carefully managed is quite efficient.

Pasteurisation.—Boiling the milk or heating it to nearly boiling-point has certain disadvantages. It gives it a somewhat disagreeable taste and smell; it coagulates the lact-albumin, making the milk less nourishing; and it interferes with its antiscorbutic properties.

Pasteurisation is a modified method of sterilisation which is found not to be open to those objections. It consists in heating the milk for from ten to twenty minutes at a temperature of 167° F. This appears to be sufficient to render innocuous the germs of enteric and scarlet fever and those which give rise to some forms of diarrhœa, but it is doubtful whether it always protects from tuberculosis.

To pasteurise milk in Soxhlet's apparatus, about an inch of water should be placed in the vessel, and the boiling continued for only twenty minutes, with the lid loosely fitted on.

The most satisfactory way of pasteurising the milk is to use Freeman's pasteuriser.

Combinations of these Methods for Practical Use

Having considered, then, the various ways of altering raw cow's milk to make it liker breast-milk in each particular, we now come to consider which is the best combination of these for practical use.

In the case of strong, healthy children in cool weather, when their mothers are unable to give much time or intelligence to their feeding, suitable dilution of fresh cow's milk, with the addition of white sugar, often does very well. Boiling, and the addition of lime water and cream in proper proportions, can usually be managed, and it is a great improvement. When, however, the mother or nurse is willing to give a little more care and time to the preparation of the food, it is much better to try to prepare a mixture which shall as far as possible resemble human milk—"artificial human milk" it is sometimes called.

Artificial human milk can be procured ready made and sterilised from various large dairy companies. This may be convenient for those who live in their vicinity, but has various disadvantages, besides that of expense, for those who are at any considerable distance from them. There have also been devised a large number of formulæ for making "artificial human milk" at home. In some of these, cream of a definite strength is used, while others are prepared by using top milk. One sample of each will suffice. The following is given by Rotch in his article on "Infant Feeding" in *Keating's Cyclopædia*, and is very simply prepared.

Mix the day's supply of milk, as soon as it is received in the morning, in the following proportions:—

Cream (20 per cent. fat)	1½ oz.
Milk	1 „
Water . . .	5 „
Milk sugar . . .	3⅜ dr. (*i.e.* one measure)

Steam in a bottle for twenty minutes, the mixture being introduced by means of a funnel in order that the neck of the bottle shall be kept dry. The bottle is to be stoppered tightly with a cotton plug. After steaming, remove the bottle immediately and allow it to cool partially, then add half an ounce of lime water and keep on ice.

Ashby recommends the following method, which works very well.

Put 30 oz. of good fresh milk in a tall glass bottle, and plug the neck of it with clean cotton-wool. Let it stand for four or five hours in a cool place (out of doors in winter and in running water or on ice in summer). Then take a glass syphon, the short arm of which will reach the bottom of the bottle, and with it syphon off the lower half (or two-thirds) of the milk. This leaves the upper 15 oz., which contains about 7 per cent. of fat (or the upper 10 oz., which has about 10 per

cent.). Lastly, replace the milk drawn off by a corresponding amount of boiled water (15 or 20 oz., as the case may be) in which 1 oz. of milk sugar has been dissolved.

The bottle is then placed in the steriliser, and the mixture kept at 155° F. for half an hour. It is then cooled as quickly as possible in running water or ice. When the infant has to be fed, as much as is required for the feed is placed in the feeding bottle and warmed up to 100° F. The stronger mixture will contain about 3 to 3·5 per cent. fat, 1·75 proteid, and 6 milk sugar; the weaker, 3 to 3·5 per cent. fat, 1 to 1·3 proteid, and 6 milk sugar.

Although the routine prescription of any good formula of artificial human milk may be, and in fact is, a great improvement on giving simple mixtures of milk and sugar and water, it is far from being the ultimate ideal in infant feeding. The experience of those who have much to do with the modification of cow's milk for delicate babies soon shows that the idiosyncrasies of different infants, and their individual capacity for digesting the various constituents of the milk, have to be observed and acted on before the full advantages obtainable from artificial feeding can be arrived at. This can only be done with freedom and accuracy where (as in the large towns of America and in London) there are properly equipped Milk Laboratories, where any prescription of a milk mixture can be made up to order. A certain degree of variation, however, for individual peculiarities is quite possible without these institutions, especially if cream of a known richness can be obtained.

Indications for Special Modification of the Milk

The indications that the amount of either butter, sugar, or proteid in the milk given is out of proportion to the needs or digestive powers of the child, are not always easy to make sure of. Dr. Holt mentions the following: If

there is too little sugar, the child's gain in weight will be too slow. Should there be too much, colic may occur, or there may be thin, green, very acid stools, which sometimes cause irritation of the buttocks. Sometimes also there is eructation of gas and regurgitation of small quantities of food.

Too little fat is usually indicated by constipation with hard dry stools, although this condition may be due to quite different causes. Excess of fat is indicated by frequent regurgitation of food in small quantities, usually one or two hours after feeding. It is sometimes shown by frequent motions, which are nearly normal in appearance. In some cases the excess of butter forms little rounded masses which look like curd in the stools, but may be distinguished by their solubility in ether and by their burning readily with an odour of butter.

The most reliable indication of the excess of proteids is the presence of undigested curd in the stools. This is a frequent cause of colic in infants. Sometimes there is diarrhœa, but more often constipation. Vomiting and regurgitation of small quantities of food are also sometimes caused by too much proteid.

Other Ways of Treating Cow's Milk

Some children have such difficulty in digesting the curd of cow's milk, that they cannot take a sufficient amount of it for their proper nutrition without having indigestion. Under these circumstances we may use a *cream and whey mixture*, with or without the addition of raw meat juice. Whey (Appendix F) contains 0·8 to 0·9 per cent. of proteid and 1½ to 2 per cent. of cream, and is very well digested by many babies.

We may also render the curd of the cow's milk more easily digested by the *addition of citrate of soda* or by *peptonising* it.

Addition of Citrate of Soda.—This was first suggested by A. E. Wright,[1] and the practical results of it were described later by Poynton.[2] The method has now been widely and successfully used.

The curdling of cow's milk which is caused by acid in the stomach produces a loose and easily digested clot. The curd which is caused by the action of rennet in an empty stomach is, on the other hand, hard and compact. This character of the rennet curd has been shown to depend on the large amount of lime salts present in cow's milk. When citrate of soda is added to the milk, a considerable proportion of the lime salts is precipitated, and the formation of curd by the rennet is thereby both delayed and rendered less complete, so that the milk is less hard to digest.

The amount of citrate of soda given is from one to two grains to each ounce of cow's milk in the bottle, and the way of prescribing it is extremely simple. A solution of citrate of soda in water is ordered, which contains in each drachm the number of grains required for each feed. The mother is told to put a teaspoonful of the medicine into every bottle before it is given. A little chloroform water should be added to the solution in order to prevent any chance of a fungus growing in it.

The addition of citrate of soda has often in my experience proved very useful. It has the advantage of enabling many babies to digest a larger proportion of casein than they could without it. It has the further advantage of increasing to a slight degree the antiscorbutic properties of the milk.

Peptonised Milk

The methods of preparing peptonised milk, either by Benger's liquor pancreaticus or by Fairchild's peptonising

[1] *Lancet*, July 22, 1893. [2] *Ibid.* Aug. 13, 1904.

powders, are too familiar to be detailed here. Peptonised milk is a valuable preparation for certain forms of dyspepsia and debility in infancy. It should not, however, be used regularly for healthy children, as the digestive powers are apt to suffer from want of use when it is given for long. The antiscorbutic element also is deficient in fully peptonised milk, so that children fed on it are apt to get scurvy.

There is less objection to milk which is only partially peptonised. This is easily effected by any method of peptonising. A convenient way is that devised by Prof. Leeds[1] in the making of what he calls "humanised milk" —that is, modified milk pasteurised, and partially digested by the use of Fairchild's "Peptogenic Milk Powder." The advantage of partial digestion is that the coagulable proteid present is greatly diminished by it, so that the drawback of the large quantity of casein in the cow's milk is obviated considerably. The method of preparation is simple, and a paper describing it fully is given with each bottle of the "peptogenic powder." Milk prepared in this way is sometimes very useful for delicate infants. As the child grows stronger the peptonising can be gradually lessened by substituting milk sugar for the peptogenic powder in increasing proportions.

Condensed Milk

Condensed milk is useful in its own place, but for the ordinary purposes of feeding infants it is not to be regarded as equivalent to properly prepared fresh cow's milk. There are many varieties of condensed milk in the market — sweetened, unsweetened, and peptonised; here, however, we shall only deal with the sweetened varieties, as they are much more used than the others. The worst

[1] "The Chemistry of Milk and of Artificial Foods for Children," Starr's *Text-book of the Diseases of Children*, 1894, p. 46.

of them are manufactured from skimmed milk. The following analysis of an ordinarily good variety of condensed milk is given by Meigs:—

	Undiluted.	As ordinarily used—diluted.
Water . . .	27·942	92·673
Fat	10·335	1·095
Casein . . .	9·522	0·868
Sugar . . .	50·861	5·206
Ash	1·340	0·158

The composition of the different brands varies a good deal, but even in the best of them, when diluted as much as they usually are, there is too little proteid; and in all there is far too little cream. If diluted less than usual so as to raise the proportions of fat and proteid, the sugar, which is mainly cane sugar, is largely in excess.

Mode of Preparation.—The water used in diluting condensed milk should be boiled and filtered. The proportion of milk to water should be about 1 to 12 for a new-born child, and from 1 to 10 to 1 to 6 in older infants. When given weaker, as is very frequently done, it may be a digestible food, but it is very deficient in nourishing properties. In all cases where it is possible fresh cream should be added.

The *advantages* of condensed milk are, that it is easily procured and prepared, and that it is readily digested by babies, owing to its being neutral in reaction and comparatively sterile, and to the curd which it forms being much looser than that of fresh cow's milk.

The *disadvantages* mainly depend on its defective composition. It is not sufficiently nourishing, and, practically, we find that in the great majority of cases, although children readily grow fat on it, they are apt to be pale and languid if they get nothing else, and to go down very

quickly when they take any acute disease. They are very apt to suffer from rickets, and they may also take scurvy.

Uses of Condensed Milk.—Under certain circumstances, condensed milk may be useful temporarily. For example, during the early weeks of life, if the child cannot digest cow's milk simply prepared, and the mother has not the time or intelligence for preparing it more elaborately, condensed milk (with the addition of cream if possible) may do well. Again, when anything goes wrong with the supply of cow's milk, or on voyages when fresh milk cannot be got, it may be invaluable.

Condensed milk, however, should never be used longer than is necessary; and if a child has ever, for any reason, to be put on it, it is always advisable to try him again, from time to time, with fresh cow's milk.

Proprietary Infants' Foods

There are a large number of so-called "infants' foods" in the market, and it is important to know something of the composition of those most in use. The manufacturers generally claim that they are "perfect substitutes for the mother's milk," but one need only glance at their analyses to see that this is not so. They all have the serious drawback that they are deficient in antiscorbutic properties, so that children fed largely upon them for a long time are apt to get infantile scurvy.

The accompanying Table, the details of which are taken with the author's kind permission, from Hutchison's book on *Food and Dietetics*, gives the composition and main characters of the "infants' foods" most often seen here. These articles are so widely used that the medical man should know what they are made of. It is, therefore, advisable to devote to them an amount of space to which their very small value in infant feeding does not entitle them.

COMPOSITION OF INFANT FOODS (HUTCHISON)[1]

Food.	Water.	Proteid.	Fat.	Carbo-hydrate.	Mineral matter.	General Description and Remarks.
Dried human milk	...	12·2	26·4	52·4	2·1	The standard of composition to which artificial substitutes should conform.
GROUP I.						
Allenbury No. 1 (for children below 3 months)	5·7	9·7	20·0	60·85	3·75	Desiccated cow's milk from which the excess of casein has been removed, and a certain proportion of soluble vegetable albumin, milk, sugar, and cream, added. No starch present. ½ oz. to 3 oz. of water for a child of 3 months.
Allenbury No. 2 (for children of from 3 to 6 months)	3·9	9·2	15·0	69·1	3·50	Resembles the above, but contains some malted flour in addition. No starch present. 1 oz. in 6 of water for a child of 6 months.
Horlick's Malted Milk	3·7	13·8	9·0	70·8	2·70	A mixture of desiccated milk (50 p. c.), wheat flour (26¼ p. c.), barley malt (23 p. c.), and bicarbonate of soda (¾ p. c.). Contains no unaltered starch when mixed. 3 teaspoonfuls (= 22 grammes) in 4 oz. of water for a child of 3 months.
Milo Food	1·56	11·03	3·92	81·38	2·11	A mixture of desiccated Swiss milk, baked wheat flour, and cane sugar (30 p. c.). 62 p. c. of soluble and 18 p. c. of insoluble carbohydrates (largely starch) present. To be made with water only.
Nestlé's Milk Food[2]	2·53	11·47	4·45	79·82	1·73	Condensed milk, wheat flour, and sugar. 28·43 of insoluble and 51·39 of soluble carbohydrates.
GROUP II. *Class A.*						
Mellin's Food	6·3	7·9	Trace	82·0	3·8	A completely malted food. All the carbohydrates in a soluble form. May be regarded as a desiccated malt extract. ½ tablespoonful (about 5 grammes), ¼ pint milk, and ¼ pint water, for a child under 3 months.
Hovis Babies' Food No. 1	3·7	7·7	0·20	86·6	1·82	A fully malted food. To be made with milk.
Class B.						
Savory and Moore's Food	4·5	10·3	1·4	83·2	0·6	Wheat flour with addition of malt. Prepared according to directions, most, but not all, of the starch is converted into soluble forms (chiefly dextrins). 1 or 2 tablespoonfuls (=1 or 2 oz.) to be mixed with 2 or 3 tablespoonfuls of cold milk or milk and water, and ½ pint of boiling milk or milk and water added.

Benger's Food	8·3	10·2	1·2	79·5	0·8	Wheat flour and pancreatic extract. Prepared according to directions, most, but not all, of starch is converted into soluble forms. The proteid is also partially digested, as well as that of milk used in mixing it. Take 1 tablespoonful (about 1 oz.) and 4 of cold milk, then add ½ pint of boiling milk and water; set aside in a warm place for 15 minutes, then bring to the boil.
Allenbury Malted Food	6·5	9·2	1·0	82·8	0·5	Wheat flour and malt. Prepared according to directions, still contains some unaltered starch. Designed for children above 6 months. 1 tablespoonful (about 1 oz.), 1 teaspoonful of sugar, and 3 tablespoonfuls of cold water; mix and add ½ pint boiling milk and water (equal parts).
Hovis Food No. 2	2·4	5·7	0·10	90·1	1·70	Contains about 7½ p. c. of starch; to be made with milk.
GROUP III.						
Ridge's Food	7·9	9·2	1·0	81·2	0·7	Baked flour, containing only 3 p. c. of soluble carbohydrates: the rest starch. Recommended to be made with milk *or* water. Made with water alone is not a sufficient food.
Neaves' Food	6·5	10·5	1·0	80·4	1·6	Resembles the above, but recommended to be made with milk and water.
Frame Food Diet	5·0	13·4	1·2	79·4	1·0	Thoroughly baked flour to which has been added cane sugar and some extract of bran. It is *not* specially rich in mineral ingredients, but nitrogenous matters are abundant and it contains much unaltered starch. ½ oz. to be mixed with a breakfast-cupful of milk and water (1 of milk to 2 of water).
Robinson's Groats	10·4	11·3	1·6	75·0	1·7	Ground oats from which husk has been removed. Rich in proteid and mineral matter.
Robinson's Patent Barley	10·1	5·1	0·9	82·0	1·9	Ground pearl barley, and of the same nutritive value.
Chapman's Entire Wheat Food	8·4	9·4	2·0	79·3	0·9	Finely ground whole-wheat flour. Not much superior in nutritive value to ordinary "household" flour. Starch mostly unaltered. To be used with milk.
Scott's Oat Food	5·8	9·7	5·0	78·2	1·3	A fine oat flour. Starch unaltered.
Nichol's Food of Health	11·9	7·7	1·7	76·9	1·75	To be used with equal quantities of boiling milk and water for making infant gruel.

[1] R. Hutchison, *Food and Dietetics*, 1906, p. 461.

[2] Holt, *Diseases of Infancy and Childhood*, 1903, p. 163.

They may be divided into three groups (see Table)—

1. **Milk Foods,** which are made from cow's milk with various alterations or additions. They are all very deficient in fat and most of them contain too much carbohydrate. In many of them also unaltered starch is present. They require merely the addition of water to prepare them for use.

2. **Malted Foods,** which consist of cereals the starch of which has been transformed, more or less completely, into soluble forms of carbohydrate. This group may be subdivided into two classes—

(*a*) Those in which the dextrinisation has been carried out completely before the food is offered for sale.

(*b*) Those in which malt or pancreatic ferment are present in the food, and partially convert the starch during the process of preparation of the food.

The malted foods are also very deficient in fat and proteid and in mineral matters. They are sometimes useful as additions to the child's milk after the sixth month, when the digestion of the casein is causing difficulty.

3. **Farinaceous Foods,** in which the starch has not been acted on by malt or pancreatic ferment. We have already seen (p. 23) that starch is an unsuitable food for babies before the commencement of dentition. The farinaceous foods form quite a suitable addition to the diet of older infants, but they are much more expensive and in no important way preferable to such things as rusks, oat flour, and rice. Ordinary farinaceous foods can be malted if required, by the use of an infusion of crushed malt such as Sir Wm. Roberts recommends [1] (Appendix F).

Food, other than Milk, suitable during the First Year

When the baby is about seven months old, his first teeth usually make their appearance; and when several of these

[1] *Collected Contributions on Digestion and Diet*, London, 1891, p. 224.

are through the gum, this is generally taken as a natural indication that its digestion is beginning to be fit for more complicated food. The child also often shows signs of being less satisfied than he used to be with his usual diet, and he gains weight less steadily. It may now be advisable to give some form of *starchy food*. If, however, the child is growing satisfactorily, and is quite contented, it is just as well to go on with milk alone for another month or two, especially if the teeth are late of coming. When, however, in a healthy child the teeth are very long of coming, this should not of itself be considered a sufficient reason for deferring the giving of starchy food. It is extremely important to explain to the mother that the starchy food has to be given *as an addition to* the milk and is not to take its place.

When the baby is nine or ten months old, he should have five meals a day (7.30, 10.30 a.m.; 2, 5, and 10.30 p.m.). These should consist mainly of milk, still diluted a little, but to the first and fourth some suitable farinaceous food may be added. For this purpose oat flour does very well, or Chapman's Wheat Flour, and barley jelly or bread jelly (see Appendix F), or one of the proprietary foods, may be used.

It is also well about this time to add to the midday meal some additional nitrogenous food, such as beef tea or chicken tea, or the white, or preferably the yolk, of an egg beaten up with the milk. The following analyses are of interest in this connection :—

Ordinary Beef-Tea. (Cheadle.)		White of Egg. (Koenig.)		Yolk of Egg. (Koenig.)	
Water	96·31	Water	85·50	Water	51·03
Fat	0·00	Fat	0·25	Fat	31·39
Proteids	0·82	Proteids	12·87	Proteids	16·12
Extractives	2·09	Free extractives	0·77	Free extractives	0·48
Salts	0·78	Salts	0·61	Salts	1·1

Food from Twelve to Eighteen Months

The midday meal may now be increased; and, in addition to what has been already mentioned, the child may have such things as mashed potato, or rusk, or bread crumbs with gravy, a lightly boiled egg, custard pudding, well-boiled porridge, or any plain farinaceous pudding. The other meals should remain as before.

Food from Eighteen Months to Two Years

At this age, in strong children, four meals a day may be sufficient, as the baby will often do without his evening meal and sleep right on till morning. A little fish, chicken, rabbit, or even butcher meat, fat bacon, or a lightly boiled egg, may now be given for dinner. The meat must be minced and pounded, as little chewing can be expected of the child as yet. The amount of mashed potatoes and pudding is also to be increased, and stewed fruit and sieved vegetables given. Bread and butter may be allowed in moderation.

Alcohol, tea, coffee, and condiments of all kinds should, of course, never be included in a young child's dietary; and pastry and cheese are also very unsuitable. Such articles are frequently the cause of serious illness in delicate children.

It is very important that during the second year *the amount of milk should not be much diminished* (1½ to 2 pints). Farinaceous and other solid food is to be given in addition to the milk, but it is not to replace it to any great extent. Neglect of this rule is the cause of much weakness and illness among children.

If the child is thirsty between meals, there is no harm in allowing him a drink of water, and if a meal is delayed he may have a glass of milk or a plain biscuit. Under ordinary circumstances, however, the frequent eating of biscuits and sweets between meals is altogether inadvisable.

The Diet of Older Children

With regard to the feeding of older children, there are a few points which require mentioning. Growing children must of course have plenty of suitable food, and big boys may need quite as much to eat as adults do. It is important, however, not only that children's food should be sufficient in amount, but also that it should be given at proper intervals and under proper conditions otherwise. Children should not have to wait too long for their meals, especially if they are young, or they will get faint and irritable, and when the food does come they will eat it too hurriedly and take too much of it.

Eating between meals also, with the exception of a light and suitable lunch, should always be discouraged. A taste for milk should be encouraged in every possible way. A strong aversion to it is manifested by some children, and this may be very difficult to overcome, but it should not be readily acquiesced in. In the case of a severe illness, the child who will take milk freely has generally a much better chance of recovery than one who refuses to do so.

Farinaceous foods form a very important element in the child's diet. Oatmeal porridge suits most children, and for those who cannot take it, its place as a wholesome and nourishing breakfast dish is difficult to fill with other things. Some children, however, cannot take it without suffering afterwards from unpleasant symptoms of dyspepsia. When that is so, it may be necessary to give it up, but before doing so it is well to try whether more prolonged boiling may not make it sufficiently digestible. Sometimes barley meal or wheat meal porridge will agree where oatmeal cannot be tolerated. Cornflour, arrowroot, sago, rice, and other similar substances are excellent additions to a child's diet, provided

that it also comprises plenty of nitrogenous and fatty foods.

Sugar in its various forms is another important food for children, and it is to be regarded as such and not merely as a means of gratifying the childish taste for sweet things. Sweets should always be given either with food or just after meals. When given at odd times between meals, they often do harm to the digestion as well as to the temper. If a child has a poor appetite and a furred tongue, sweets of all kinds should be strictly forbidden.

Animal food is best given to young children in the form of eggs, fish, and white meat. Butcher meat should always be used sparingly. This is especially important in the case of those who are nervous or come of gouty families. Children who are having more meat than they can properly digest are usually slender and pale-faced and have a furred tongue, a bad breath, and other signs of indigestion. They often sleep badly, are drowsy in the mornings, and apt to be languid and irritable.

Such things as salt beef and salted or smoked fish are bad for young children; and fried foods, with the exception of bacon fat and lightly fried white fish, should, generally speaking, be avoided. The fat of meat is good for children, and they should, on all accounts, be taught to eat plenty of it. Butter is also good for them, and should be given liberally.

Fruit, if fresh and ripe, is very wholesome for most children, and so to a less degree is jam, but the latter should not be allowed to take the place of butter. Fresh vegetables are also useful, and a taste for them should be cultivated.

Tea and coffee are bad for the young, and indeed most children are better not to have them regularly before they are at least ten or twelve years old. Cocoa is much

more suitable, and forms a nourishing and popular beverage which may be given with advantage even to children of four or five years. Pickles and all sorts of highly seasoned foods are, of course, never to be given to healthy children. Occasionally, however, cases are met with in which dyspeptic children benefit considerably from being cautiously allowed to gratify their craving for such tasty articles of diet.

CHAPTER XXIV

ON NURSERY HYGIENE[1]

Clothing

The details—even the minute details—of a child's clothing are well worthy of attention. We will refer briefly to the main principles which should regulate them.

General Principles.—A child's clothing should be uniformly warm, soft, and light. It should also be moderately loose, so that it does not exert undue pressure on any part of the body and can be quickly put off and on.

The clothes must be sufficiently **warm** not only because this is necessary in order to prevent chills, but because, if the body is not adequately protected, it has to waste more nerve energy in heat production than it can fairly afford. Children's heat-producing powers are feebler than those of adults; sufficient clothing is therefore especially important for them. Any attempt at hardening a child, as it is called, by under-clothing him, is to be regarded as even more foolish than over-heating him by too many or too thick clothes.

It is also extremely important that the protection from cold provided by the clothing should be uniform. Many recurrent catarrhs of the respiratory and digestive tracts are due to bare arms and legs and scantily covered bellies.

[1] On the subject of this chapter the reader will find much useful information in *Health in the Nursery*, by Henry Ashby, M.D., London, 1898; *The Care of the Baby*, by J. P. Crozer Griffith, M.D., 2nd ed., Philadelphia, 1898; and in *Hygiene of Childhood*, by Francis H. Rankin, M.D., London, 1890.

Long sleeves and stockings and a knitted or flannel binder are very effective in warding off such attacks.

Paralysed limbs especially should be well covered, both in the daytime and at night. Warmth favours the circulation in them and lessens the often inevitable atrophy. Should ordinary thick or double stockings or sleeves not be sufficient, it is well to have them padded with cotton-wool.

The baby's clothes should be **soft, light,** and **loose,** because his skin is soft and tender and easily chafed, and his movements are so feeble as to be readily hampered by slight restraint. Constriction of any part of the body or limbs is prejudicial to normal growth and development, and is therefore to be avoided.

Lastly, little children ought to have their dress so arranged that it can be **put on and off** as **quickly** as possible. This is more important in the case of feeble and sick infants, who may suffer seriously if they are wearied and irritated and chilled by an unnecessarily complicated process of dressing and undressing. In all serious illnesses it is advisable to discard ordinary clothes with their numerous buttons, and tapes, and bands, and to substitute for them simple flannel night-clothes lined with thick layers of cotton-wool or some similar substance.

When we come to apply these elementary principles, we find that woollen garments of loose texture (*e.g.* knitted ones) are the best for a child to wear, especially next the skin. Wool is a bad conductor of heat but is easily permeable, so that it does not interfere with the free evaporation of moisture from the skin. The only exception to this is in the case of the napkins which babies have to wear until they gain some measure of control over the bladder. These are generally made of linen or cotton, because they have to be frequently washed. Occasionally we find a mackintosh worn over the napkin to save trouble. This may be allowable under special

circumstances, as on a journey, but when used habitually it is most objectionable, as it is sure to cause irritation of the skin. When soda is used instead of soap in washing the napkins, there is also a risk of skin irritation.

When, in cases of diarrhœa, there is much redness of the parts surrounding the anus caused by irritating fæces, it is sometimes a good plan to place a large pad of absorbent cotton-wool inside the diaper. This absorbs the liquid fæces in such a way as to prevent their coming in contact with so large an area of skin as is the case when the motion spreads itself out over the napkin.

The child's bed-clothes should not be so thick and heavy as to overheat him, but they require to be a little warmer than those he wears during the day, to make up for the want of exercise while sleeping.

Fresh Air and Sunshine

For children, fresh pure air, cleanliness, and warmth are absolutely necessary for perfect health, and sunshine is especially important. Children, like flowers, get pale and droop without the sun. The nursery should therefore, if possible, be the sunniest, driest, freshest room in the house. It should have a southern exposure, be well ventilated, and kept at a temperature of 60° to 65° F. In the badly ventilated rooms of the poor, the windows should be widely opened several times during the day, and one window at least should be constantly open for some inches at the top.

The children of many of the respectable poor are less robust than those of their more careless neighbours, just because of the care with which they are protected from cold and at the same time from fresh air. This injudicious keeping in a close atmosphere is especially dangerous during convalescence from such diseases as measles and whooping-cough. At such a time it may make all the difference

between complete recovery and the acquisition of tuberculosis.

Draughts.—While seeing carefully to the ventilation, however, we must, in many forms of illness, be careful to avoid draughts. For healthy children, the risk of injury from draughts is much less than that from deficient ventilation; but for those who are liable to recurrent bronchitis or rheumatism, the danger is a real and important one. It is well to remember that in cold weather large plate glass windows cause a constant draught in their immediate vicinity.

Going Out.—As a general rule, a baby should be taken out every fine day, summer and winter. If he is born in summer, he may be taken out for the first time about a fortnight after birth; if in winter, not for a month or six weeks—and then only if the weather is very fine. At first he should not be out longer than from fifteen to twenty minutes, but later, if the weather is warm and dry, he can scarcely be too much in the open air. It is important not to allow young or delicate children to be taken out in windy weather, even although the thermometer is not very low, because they are readily chilled by wind. In the same way it is important that babies should be carefully protected from the sun in warm weather. The evaporation which takes place from wet roads is sometimes a source of chill in the case of delicate children who are old enough to walk, even although the weather overhead is not very cold.

Little children should not be taken out, even in good weather, if they are coughing and sneezing or otherwise suffering from the results of a recent chill. When, however, children who are past babyhood are well, it is safest in the long run to err, if at all, in sending them out too much or in too cold weather rather than in keeping them too much

shut up. If a child has a tendency to eczema, he should be carefully protected from cold winds.

Washing and Bathing

A baby should have one bath every day, and if he is strong he may have two. Harm is certainly often done by bathing delicate children too much. For babies who are not strong, one regular bath, and sponging in place of a second, is much better than two baths.

The temperature of the bath should be about 90° F. in the case of young babies, and if they are delicate, it is always well to use a bath thermometer. The water should never be warmer than 95° F. As the baby grows older, the bath, especially in warm weather, may be reduced to 85° or even 80°.

Very little soap is required for the general surface of the body in a young infant, and soaps containing much free alkali are especially to be avoided. For children with delicate skins, some form of overfatty soap is desirable; but for ordinary healthy children, plain unscented soap does quite well.

The bath should be given in a part of the room where there is no draught, and the baby should never be in it more than five minutes. The drying process after it must be rapid and thorough. It is customary after drying the baby to apply some soothing powder to those parts where folds of skin are in apposition. For this, oxide of zinc and starch and boracic powder (F. 10) or plain fuller's earth may be used. Should there be any tendency to intertrigo, some simple ointment, such as zinc ointment, cold cream, or vaseline, is better.

If a baby's skin and nails turn blue and his nose and limbs get very cold after the bath, and it seems to weaken and depress him, it may be necessary to stop the bath and

only to have him sponged instead, as much as is necessary for cleanliness.

The Cold Douche.—Ordinary cold douches are very good for many older children, but for the little ones in the nursery, and those who are delicate among the older children, they should only be given in modified forms and always with caution and attention to details.

The best way to give a cold douche to little children is, after they have been washed in warm water and are still sitting in it, to pour some cold water from a big sponge or from a jug over their shoulders, and to take them out immediately and dry them thoroughly.

When a cold douche is to be given to a delicate child, he should always, while he is having it, stand in a little hot water. When this precaution is taken, the bath will often do good when otherwise it would not have done so. Care should also be taken that the room is warm and that the child is not allowed to chill himself before the bath begins by hanging about or playing without sufficient clothes on. *Disregard of precautions in such matters often results in recurrent ailments which are attributed to special delicacy.* It is a good plan to have the child shampooed thoroughly all over for five or ten minutes before the bath, and energetic friction with a rough towel in drying, after it, is stimulating and beneficial.

Uses of the Cold Douche.—Cold douching carefully carried out is extremely useful for many children. It stimulates the nervous system, improves the circulation, and often does away with the coldness of the feet, which is such a troublesome symptom. The appetite also increases under its use, and the children become altogether healthier and happier and are less liable to take cold.

Modification of Cold Douche. Sometimes the cold douche disagrees with the child, and causes unpleasant

symptoms. For example, instead of its leaving him with a healthy glow and an increased appetite and generally brightened up, he may be pale and shivery after it, with cold blue fingers and a disinclination for food; or the healthy reaction may only last a short time and be followed by weariness, headache, and a feeling of chilliness.

If a cold bath, given with all due care and precaution, results in either of these conditions, it must be modified or discontinued. Often a tepid salt water bath does very well in such cases, the salt increasing the stimulating effect of the water on the skin. Again, in children with a weak circulation, thorough rubbing of the body, with a coarse towel which has been wrung out of cold water, is sometimes an excellent substitute for a regular bath.

In other cases, the cold bathing may be limited to certain parts. Children with cold feet who cannot stand an ordinary douche may be benefited by having their feet bathed in cold water and afterwards briskly rubbed; and a similar cold sponging of the throat and shoulders is useful for diminishing the liability which some children have to take throat colds. Lastly, many children who cannot stand cold bathing in winter may benefit from it greatly during the summer months.

Hot Baths.—While cold baths may do harm sometimes, hot baths are just as likely to do so if injudiciously given. They must not be given too hot or too often (once in the week is enough), and the child should not be long in them —never more than ten minutes at most. The effect of such a hot bath is stimulating, but a long-continued one is weakening and relaxing. It is important that the child should not catch cold after the bath, hence it is better to give it just before he goes to bed.

Sea-water Baths.—Sea-water baths are good for children of all ages, but a child should not usually be allowed to bathe

in the sea until he is six or eight years old, or oftener than once a day. The best time for a sea bath is three hours after a meal, but the child may go before breakfast, provided he has a biscuit and milk before starting. The bath should never be taken immediately after a meal, and never when the child is feeling chilly or is hot and perspiring. The head should be wetted first, and the child should not, even in hot weather, be allowed to stay in longer than fifteen or twenty minutes. After the bath he should be rapidly dried and dressed, and should have a sharp walk and a biscuit or a glass of milk.

Sea-bathing should make a child hungrier and in better spirits. If, however, he gets dull and chilly and seems out of sorts while he is having it, this indicates that it is not agreeing with him and that it should be stopped. Children who have perforation of the tympanum should not be allowed to bathe in the sea.

The Hair.—The hair should, of course, be kept very clean, but much washing, especially with soap, certainly causes dryness. In little boys with short hair, the head should be washed every day; but in older children with long hair, once a week is enough. If, with an ordinary amount of washing, the hair gets very dry, it may be necessary to use a small amount of oily matter of some kind to replace the natural grease which washing has removed; but, as a general rule, it is better in every way to put no pomade of any kind on the hair.

If scurf gathers on the scalp, it should be removed by washing with soap and water, or, better still, by spirit of soap. A comb should not be used for this purpose, as it is apt to injure the roots of the hair. For the same reason, the brushes used for children's hair should be soft, and the teeth of the comb should be blunt and not too close together.

CHAPTER XXV

ON THERAPEUTICS

Baths and other External Applications for Therapeutic Purposes

Cold or Tepid Sponging.—Cold sponging is very useful for reducing temperature, and should generally be tried before having recourse to stronger measures. Its effect is increased if spirits of wine, Eau de Cologne, or vinegar is added to the water. The water may be used at 80° F., and the process should last five or ten minutes. Care must be taken that the child is not unnecessarily exposed nor his bed wetted.

The Wet Pack.—The ordinary wet pack is also of value, being easily applied and more efficacious in reducing temperature than simple cold sponging. A small sheet or large towel wrung out of cold water is rapidly folded round the child and he is then wrapped up in a blanket. The pack may be repeated in twenty minutes unless the child is sleeping, in which case he may be left in it for an hour or more. This is useful in all general feverish conditions.

Local wet packs or wet compresses are useful in many illnesses. The application of a wet stocking round the neck is an excellent domestic remedy for a simple sore throat; and a wet compress around the abdomen at night is soothing and efficacious in some forms of indigestion with discomfort.

The Brandy Pack.—In cases of ptomaine poisoning, with or without vomiting or diarrhœa, when the skin is

inelastic and the urine scanty, Dr. Eustace Smith[1] recommends that a large towel, wrung out of cold water containing a sixth part of brandy or Eau de Cologne, should be wrapped round the child's body, and that he should be left covered with several blankets for three hours. The pack is renewed at the end of this time, and the child may sometimes be kept in such a pack for twenty-four hours with advantage.

The Mustard Pack.—This is a useful form of external stimulant for cases of collapse or prostration. It causes less disturbance to the patient than the mustard bath. A tablespoonful of mustard is mixed with a quart of tepid water, and a towel is dipped in this and swathed round the whole body. The pack may be continued for ten or fifteen minutes, at the end of which time the body will be distinctly red. Similar applications to the chest are often useful in cases of bronchitis and collapse. During the intervals between their application a cotton-wool jacket should be worn.

The Cold Douche.—The best method of applying the cold douche, and its stimulant value, for delicate as well as for strong children, have been already discussed (p. 563). We shall afterwards refer to the great benefit to be derived from it in cases of rickets with laryngismus or other neuroses.

The Cold or Tepid Bath.—A cold bath is very useful for reducing temperature in children, and their small size makes it easy of application. The patient should be put into water at about 100° F., which is then gradually cooled to about 80°, or even 75°, by adding cold water or ice. The child may be kept in the bath from five to fifteen minutes, and the state of the temperature and pulse must be closely watched all the time.

The Warm Bath.—The warm bath (90° F.) is used as a

[1] "The Diet and Therapeutics of Children," *Allbutt and Rolleston's System of Medicine*, vol. i. p. 254.

soothing application in cases of convulsions and laryngeal spasm. It is also useful as a diaphoretic, and is often given in the early stage of measles and other eruptive fevers to encourage the rash to come out more fully. The child may be kept in it from ten to twenty minutes.

The Hot Bath.—A hot bath (100° F.) is of great value as a stimulant, especially in children exhausted by severe diarrhœa and vomiting and in those with pulmonary collapse. The child must not, however, be allowed to remain too long in the water, or he will be depressed. For an infant, three minutes is long enough, and for an older child about five minutes. The child should be rapidly dried after the bath, and put between blankets, with a hot bottle at his feet.

The Mustard Bath.—The addition of mustard to the hot bath makes it more stimulating and effectual. The proper proportion of mustard is 1 oz. to each gallon of hot water. The mustard is made into a paste with a little cold water and then gradually stirred into the bath, or it may be put into it in a muslin bag. The child is held in the bath till the arms of the person holding him begin to tingle. This is a very useful remedy in cases of prostration and collapse of any kind—especially in young infants.

Ice Bags.—These require to be used with great care in infants, owing to the danger of depressing them too much. If the child is very restless, also, there may be great difficulty in keeping the ice bag properly applied. In many cases, however, in which this method of treatment is used, the patient is too ill to move very much.

The ice bag is frequently used in acute head cases, and great benefit may be derived from its use in acute pericarditis (p. 249). For this,[1] a bag large enough to cover the præcordia is used, and it may be held in place by a light

[1] D. B. Lees, *Treatment of Some Acute Visceral Inflammations*, London, 1904, p. 32.

flannel jacket with a hole in front for the screw cap of the ice bag to come through. There should be nothing between the bag and the patient's skin. The ice should be renewed about every hour and a half. It is important during the application of the ice bag to watch that the right auricle does not become overdistended, and of course the patient's extremities must be kept warm with hot bottles all the time. The temperature, pulse, and respirations should be recorded every two hours.

Of the use of the ice bag in pneumonia, pleurisy, and nephritis, which has been strongly recommended by Dr. Lees, I have had little experience.

Hot Fomentations.—These are made with flannel or spongio-piline, and are generally most used in chest cases. They are cleaner than poultices and require less skill for their proper application.

Poultices.—Poultices are not so much used now as they formerly were. This is partly because it is so difficult to get them properly made and applied; and their place is largely taken by hot fomentations. In many cases, however, where a child is suffering from uneasiness in the abdomen from any cause, a large poultice is very soothing, and may secure a measure of relief which it would be difficult to obtain in any other way. Poultices are also very useful when there is pleuritic pain.

Mustard Poultices.—Mustard poultices are very valuable. For young babies, they should be made with one part of mustard to five of linseed meal. The mustard and linseed are mixed together dry in a bowl, hot (not boiling) water is then added, and the poultice is made, and applied on a handkerchief. It may be left on for six or eight hours, and should be followed by a thick layer of cotton-wool. For older children, the proportions may be one to three or four, but the poultice should not be left on longer than four hours.

Pure mustard must never be applied to an infant's skin, as it is apt to produce serious sloughing. In older children, a small mustard plaster or a piece of mustard leaf the size of a penny may often be applied to the episternal notch with great effect in cases of irritating throat coughs, such as are met with during the eruptive stage of measles.

Blisters.—In young infants, blisters should scarcely ever be applied, and even in older children they must only be used with great care on account of their tendency to cause sloughing and the risk of their irritating the kidneys. It is generally best, to begin with, to leave the blister on for one or two hours only, and if it has not risen then, to apply a poultice over the place. Blisters are sometimes useful in pericarditis with effusion and in endocarditis, also in some cerebral cases where there is an increase of fluid in the ventricles.

Bleeding.—It is generally accepted that in old times the practice of blood-letting was carried much too far, and that in children injudicious venesection or leeching is more dangerous than in adults. Certainly, however, in recent years many have gone too far in the opposite direction, and have abstained from bleeding when it would have done a great deal of good. My own experience has been entirely in accordance with that of Dr. Lees, that in suitable circumstances, bleeding "is a remedy of priceless value, capable of giving immediate relief impossible by any other means."[1]

The condition which most frequently calls for blood-letting is rapid overdistension of the right heart such as occurs in acute pericarditis, in the later stages of mitral stenosis, in acute pneumonia, and during acute exacerbations in chronic bronchitis. The chief indications are severe dyspnœa and the physical signs of a distended right auricle (p. 240).

[1] D. B. Lees, *The Treatment of Some Acute Visceral Inflammations*, London, 1904, p. 30.

Bleeding is also of value in uræmia, and in acute meningitis and otitis in strong children.

Venesection is in some ways preferable in older children, but in infants the operation is often extremely difficult, and if leeches can be got they are much more convenient. The best place for the application of leeches, in cases of distended right auricle, is below the right nipple. In this situation they do not interfere with the subsequent examination of the heart, and the bleeding can be arrested by pressure against the ribs. In bad cases, two leeches may be applied in the case of a baby, and from three to six in that of an older child.

In cases where leeches are not to be got and venesection is impracticable, bleeding may, according to Coutts,[1] be satisfactorily carried out by puncturing the dorsal artery of the foot.

Dry cupping is often very useful in children, especially in renal cases when uræmia threatens.

Medicinal Treatment

In the treatment of children there can be no doubt that drugs should usually occupy an altogether subordinate place. In most cases, directions as to such matters as food and drink, fresh air and exercise, clothing and rest in bed, freedom from causes of worry, and pleasant occupations, are far more valuable than any medicines. In practice these things are far too apt to be taken for granted when medicine is prescribed. Not only should definite directions be given about them, but when they are important they should generally be written down. If this is not done, the details on which their efficacy largely depends are very apt to be forgotten or misunderstood.

While the value of drugs, however, in treating children has sometimes been exaggerated, it is often also under-

[1] *Edin. Med. Journ.*, Sept. 1902.

estimated. In suitable cases many medicines are of the greatest value.

Dosage.—It must be acknowledged that Gaubius' table and other posological tables are sometimes useful to the beginner in helping him to prescribe suitable doses for children. Their usefulness, however, is very limited. The age of the child is not the only criterion to be taken into account in deciding the proper dose. His condition as to size, weight, and strength is often quite as important. We have also to remember that while some drugs, such as opium, have to be given with special caution, others, like digitalis and quinine, are well borne, and one or two, such as belladonna and arsenic, can usually be taken in larger doses by children of five to ten years than by adults.

It is particularly important, in dealing with children, to have fluid medicines measured, if possible, in a measure glass rather than in a teaspoon or by drops. If this is not possible, we must inspect the teaspoons which are to be used and try the bottles which are to be dropped from. The teaspoons in ordinary use differ considerably in size, and many of them contain 90 instead of 60 minims. The size of drops also varies greatly not only with the nature of the fluid measured, but also with the shape of the bottle from which they are dropped.

The form of the dose is of more importance in children than in older patients. The medicine should of course be made as palatable as possible, and a large dose should not be ordered if a small one will do as well. Obstinate refusal of medicine is more likely to be met with in children with slight ailments than in those who are seriously ill. When, however, this occurs in grave illness, it becomes a matter for serious consideration whether the consequent struggle may not do more harm than the medicine does good.

A few remarks may be made about some of the drugs which are most useful in the treatment of children.

Alcohol.—Stimulants should never, of course, form part of a healthy child's diet, but in debility great benefit sometimes results from small doses of wine or beer or diluted brandy taken with food. Alcohol is also frequently of great use in acute disease, in childhood as in later life. In ordinary feverish illnesses, stimulants are not required; but if there are signs of heart failure, or if a typhoid condition should set in, they are urgently called for. They are also useful in various exhausting conditions, such as the pulmonary and other complications of whooping-cough or measles, and in septicæmia.

Alcohol may be administered in the form of brandy, whisky, wine, or sherry whey. For dispensary patients in Scotland it is best to order whisky, as it is more easily obtained of good quality than the other forms of stimulant. If it is desirable to give small doses of alcohol to an infant whose surroundings are such as to render it inadvisable to order plain whisky, a few drops of rectified spirit or brandy may be added to each dose of any medicine that he is taking. When whisky is ordered for young babies, it must not be given too concentrated—not more than fifteen drops to the teaspoonful. In ordering stimulants, it is always well to indicate the minimum to be given in the twenty-four hours, and also the amount that is not to be exceeded. A baby of a year or two old may have from two drachms to half an ounce of whisky or brandy in the twenty-four hours, and this may be increased in some cases to one or even one and a half ounces. To a child of three or four, double this amount may be given. Small doses frequently repeated and well diluted are preferable to larger doses given at longer intervals. If the amount of the stimulant is not strictly prescribed, the patient will be liable to get either

too little or too much. I have seen several children whose parents were distressed on account of their torpor and inability to recognise their friends, and in whom those symptoms were solely due to their having had too much alcohol.

Sherry whey (see Appendix F) forms a useful way of giving alcohol to young babies. The nourishment it contains, though not large in amount, is in a very digestible form. The following analysis is given by Myers and Still:[1]—

Proteid (mostly lactalbumin)	0·45 per cent.
Fat	0·95 „
Milk sugar	5·00 „
Alcohol	2·30 „

It has a markedly acid reaction. The alcoholic strength when made from "cooking sherry" is about one-eighteenth that of brandy. If good drinking sherry is used, a larger amount of the wine is necessary to produce coagulation, and the alcoholic strength is therefore greater. Sherry whey is often retained by an irritable stomach. It may be given as the only diet for a short time, or alternately with some other form of food. When there is flatulence and colic it has often a markedly carminative effect.

Tonics.—Tonics are sometimes of great value, and their use will often speedily bring a child who has been ailing back to his normal condition. In some instances, however, their application is much restricted owing to the child's digestion being easily upset by them, and the improvement, if any, is therefore only partial or temporary. When this is so, a change to the country, especially to hill air or to the seaside, may have an immediate and lasting good effect.

Cod Liver Oil.—Perhaps the best and most generally useful of all tonics for young children is cod liver oil, but

[1] Myers and Still, *Lancet*, Jan. 12, 1907.

it must be given in moderation, and with discretion, or it is apt to disagree. It should not be ordered if there are signs of dyspepsia; and if its administration interferes with the child's appetite or digestion, it must be discontinued for a short time and an alkaline or acid tonic substituted. This often improves the digestion, after a week or two, so much that the child is able to take the oil again with benefit. Those who can take cod liver oil well in winter are often unable to digest it during hot weather. It is of great value in all cases of rickets, anæmia, and debility in which the digestion is sufficiently strong to be able to stand it. From 10 to 30 minims thrice daily is a sufficient dose for most young children, and it may either be given pure or in the form of an emulsion (F. 20 and 21). If it agrees well, the dose may be increased to a teaspoonful; but if undigested oil is noticed in the motions, the dose must be diminished.

When cod liver oil cannot be taken by the mouth owing to the state of the digestion, it is sometimes used in the form of inunction. For this purpose, however, any simple animal fat or oil does as well as cod liver oil, and several, such as neat's foot oil and benzoated lard, are preferable because they have not such an unpleasant smell. Cocoa butter is said to be equally efficacious. The child is given a warm bath, and the oil is then warmed and carefully rubbed into the skin all over the body with a soft sponge or piece of flannel, and he is put to bed with a flannel nightdress on.

Iron.—Iron is a most useful drug in children. It has, however, to be given to them with caution because of the risk of its disagreeing with the digestion. A convenient form for its administration is reduced iron. Of this gr. $\frac{1}{2}$ to i may be given to infants thrice daily, and grs. i to iii to older children. It is readily taken, and has the advantage over liquid preparations that it does not discolour the teeth.

When constipation is present, the sulphate may be given along with sulphate of magnesia (F. 11).

Arsenic. — Arsenic is usually given in the form of Fowler's solution, and is one of the drugs which children bear well. It is useful in certain forms of anæmia, and may be given in doses of two to five drops well diluted thrice daily after food. It may also, sometimes, be prescribed with advantage, in small doses, as a tonic to children who show a special tendency to catch cold, and to those who are taking bromides, to prevent a skin eruption.

It is of special value in certain kinds of dyspepsia at all ages, in which there is colicky pain or a liquid motion, or both, immediately after taking food (p. 144). For such cases one drop (in young infants $\frac{1}{4}$ to $\frac{1}{2}$) should be given, well diluted, immediately before food several times a day. The use of arsenic in chorea has already been fully considered (p. 366).

Quinine.—Quinine is one of the drugs which children bear well and can take in comparatively large doses. Its taste, however, constitutes a great difficulty, and prevents its being ordered as frequently as it otherwise would be. It is usually given in solution, one grain of the sulphate to a teaspoonful, and some flavouring or sweetening substance (such as syrup of orange-peel, 20 minims to a $\frac{1}{2}$ grain) may be added, though none of them are very successful in disguising the taste. Larger doses may be shaken up rapidly with syrup and swallowed before much has been dissolved. Probably the best way to administer it to young children is to order it suspended in glycerine (one grain to the drachm), and to direct the nurse to give the dose in a wineglassful of milk (E. Smith). In children over three the sulphate may be given in the form of capsules, or it may be made up into very small pilules which can be mixed with jelly and thus swallowed (West). The tannate

may also be given in powder or with chocolate. It is comparatively tasteless, but has to be given in three times the quantity of the sulphate, and is said not to be so reliable in its action. If quinine cannot be given by the mouth, it may be administered in the form of suppositories or as an enema—double the ordinary dose being used. It may also be given hypodermically, but this method is rarely warranted in children, except in malaria, in which it is most valuable.

It is given in septic cases, in malaria, and in some other forms of pyrexia. It is useful in whooping-cough, but has to be given in large doses (grs. iii to iv for a child of eighteen months) (Leech). It is sometimes most successful in chronic urticaria in young children, a dose (gr. iss for each year of the child's age) being given at bedtime (E. Smith).

Strychnine.—Solution of strychnine and tincture of nux vomica are useful tonics, and are usually taken quite well if sufficiently diluted. Of the former, one-third to one minim thrice daily may be given to children of one to five years old, and two minims to older children. Of the latter, one and a half times these doses may be employed.

In cases of extreme collapse from infantile diarrhœa, Dr. Eustace Smith recommends the hypodermic injection of $\frac{1}{4}$ minim of solution of strychnine, to be repeated in three-quarters of an hour.

Digitalis and Strophanthus.—These are well borne even by young children.

Mineral Acids.—The dilute acids are often of benefit in certain states of the digestion. They are also useful in diarrhœa, on account of their anti-fermentative action. One or two minims of dilute hydrochloric, nitric, nitro-muriatic, or sulphuric acid may be given in each dose to infants of from six to twelve months, and from two to four minims to children of from five to ten years. It is well to dilute the acid to the extent of a teaspoonful to each minim,

otherwise there may be difficulty in getting a child to take the medicine on account of its taste.

Alkalies.—There are few medicines which are so often successful in temporarily improving the condition of weakly children as alkaline tonics, consisting of bicarbonate of soda and any bitter infusion with or without the addition of nux vomica (F. 10). Alkalies are also of great use in the treatment of many nervous and other ailments arising from an acid fermentation of food in the alimentary canal (p. 148) and in lithæmic conditions (p. 512).

In feverish conditions, a mild alkaline mixture containing liquor ammoniæ acetatis or citrate of potash is indicated; and in urinary disorders with acid urine, large doses of the citrate (30 to 120 grs. in the day for an infant) may be required to keep the urine alkaline.

Mercury.—Grey powder, calomel, and solution of perchloride of mercury are much used in childhood, not only in the treatment of syphilis (see Chap. XXII.) but also in various dyspeptic disorders, on account of their antifermentative action. Full doses of mercury by the mouth or by inunction are also useful in some other forms of disease, as in non-tubercular meningitis. Calomel is a useful purgative in many conditions. In cases of acute tonsillitis and commencing laryngeal catarrh, the treatment should generally begin with a mercurial purge. The great value of mercury as an adjuvant to digitalis in some cardiac cases has been already referred to (p. 247). One grain of calomel may be given to a child under twelve months, two grains to one of two years, and three grains to those between three and seven years old; or one-sixth of a grain may be given every hour until the bowels act.

Weak mercurial ointments (*e.g.* nitrate or ammoniochloride of mercury, grs. viii to ℥i) are very useful in the

treatment of impetiginous eczema and of most forms of superficial sore in strumous children.

Opium.—Opium is a valuable remedy in childhood; but it must be used with care and its effects watched, especially in infants, as they are very susceptible to its action. To premature babies and those who are suffering from severe or acute respiratory disease it should never be given.

It is chiefly of use in relieving pain and in quieting the action of the bowels. It forms a useful addition to diarrhœa mixtures, not only on account of its effect on the peristaltic action, but also because, by diminishing the rapidity with which the other ingredients pass through the bowel, it gives them time to act. It may also under certain circumstances be useful in allaying spasm, as in whooping-cough and croup, and in soothing irritable coughs, but it should never be used for ordinary restlessness or to procure sleep. The great value of opium in some cases of pneumonia has already been referred to.

The dose must be regulated by the size and strength of the child as well as by his age—a wasted baby of a year old requiring a smaller dose than a big strong child of six months. Some children are specially intolerant and some more than usually tolerant of the drug. Cases of extreme susceptibility to opium in strong children are very rare indeed, and if reasonable precautions are taken, no danger of poisoning need be feared. The effect of the first dose should always, however, be watched; and if the child is not to be seen again for some time, it is well to instruct the mother not to repeat the medicine if he is drowsy, and to stop it whenever the symptoms for which it is being given are relieved.

Laudanum, nepenthe, and solution of hydrochlorate of morphine (B.P.) may be taken safely by children a year old in doses of $\frac{1}{2}$ to 1 minim, while to those of six months, $\frac{1}{6}$ to $\frac{1}{3}$ of a minim, and to those of two months, $\frac{1}{20}$ of a minim, may

be given. A child of twelve months may have ½ to 1 gr. of Dover's powder.

Compound tincture of camphor is a convenient form in which to give small doses of an opiate to children. To infants during the first year one drop for each month of their age, and to a child of five years half a drachm, may be given.

Codeine is sometimes helpful in cases of abdominal pain and tenesmus, and for coughs. For a child of a year old, $\frac{1}{20}$ of a grain is a suitable dose, and from $\frac{1}{12}$ to $\frac{1}{6}$ of a grain for one of four or five years. Heroin ($\frac{1}{100}$ to $\frac{1}{30}$ of a grain) is sometimes useful in persistent coughs. Morphine may be given hypodermically, in doses of $\frac{1}{300}$ to $\frac{1}{200}$ of a grain, to a strong infant of a year old.

Chloral Hydrate.—Chloral is well borne by children. It is especially useful in cases of infantile convulsions (pp. 316 and 318) and in those which complicate whooping-cough. In young infants it is best given per rectum (1 gr. for a child of a month, 5 grs. for one of six months, and 10 grs. for one of a year old). It may be given by the mouth to children of one or two years old, in doses of 2½ to 5 grs., and to older children in doses of 5 to 10 grs.

Butyl Chloral Hydrate is often given successfully for whooping-cough and other kinds of spasmodic cough, in doses of 1 gr. for a child of twelve months (F. 27).

Bromides of Potash, Soda, and Ammonia. — The bromides are more generally useful than chloral. They may be given for the irritability of teething, for sleeplessness, and for nervousness of any kind. When a nervous child has to undergo a slight operation, such as excision of the tonsils, without chloroform, it is sometimes advisable to give him a large dose of bromide. Although this will not diminish the pain of the operation, it will make the patient drowsy and

lower his sensibilities so that he will suffer less from the fright of it than he would otherwise do. In a similar way, children who are made very sick by railway travelling are sometimes greatly benefited by a dose of bromide before they start.

Under ordinary circumstances, from 1 to 2 grs. every two or three hours may be given to infants of a month or two old, while children of a year or more may have 3 to 5 grs. repeated at similar intervals.

It is well to remember, when bromides are being given to a baby, that a serious-looking pustular rash may appear. This condition is not very rare, and may occur after small as well as large doses, being due to an idiosyncrasy on the part of the child.

Antipyrine is an extremely useful drug in childhood, and is applicable under a great variety of circumstances. Although first introduced into practice as an antipyretic, and sometimes efficient in that capacity, its main value depends on its sedative action. To children who are atrophied or prostrate from acute disease it must be given with caution, if at all. Generally, however, it is well borne even by young infants.

It is often successful in cases of whooping-cough which are not complicated by much bronchitis, and also in chorea. For night-terrors and restlessness it is very useful, and for laryngismus and spasmodic croup it is a more reliable sedative than the bromides. It is also useful in colic and in the pains accompanying dentition in young infants. In cases of high temperature from septicæmia and pneumonia, it relieves the restlessness even when it has little or no effect on the pyrexia. One grain every four hours may be given for each year of the child's age during the first three years. For night-terrors, in a child of from five to ten years a dose of from 5 to 10 grs. may be given.

Phenacetin may be used in the same cases as antipyrine and is also well borne. It has the disadvantage of being insoluble, and the advantage of being tasteless.

Belladonna is a drug which children bear remarkably well. The tincture may be given to babies of a year in doses of 2 or 3 minims, and for children of six or eight years, from 10 to 20 minims is a usual dose. It is useful in some cases of broncho-pneumonia, pulmonary collapse, and whooping-cough, and especially in enuresis.

Emetics.—In acute indigestion, emetics are valuable in getting rid speedily of the contents of the stomach. In bronchitis also they are of great use in helping to clear out of the bronchi any secretion which may be blocking them, and which is not effectually removed by coughing.

The most effectual and safest emetic is powdered ipecacuanha, and it should be given in doses of 5 grs. every ten minutes until vomiting occurs.

Ipecacuanha wine acts well when it is fresh, but should never be trusted to otherwise, as its emetic properties are greatly diminished by keeping. We may also give sulphate of copper (½ grain every ten minutes) or alum (1 drachm in syrup at similar intervals). Apomorphine should not be used, as it is too depressing.

Purgatives.—Castor oil is generally regarded as the safest and most reliable of purgatives. Its taste, which is its chief disadvantage, may be disguised, to a considerable extent, if the dose is shaken up in a bottle with a wine-glassful of hot milk, sweetened and flavoured by a piece of cinnamon having been boiled in it. Another successful device is to give the child a mouthful of dry oatmeal immediately before he takes the oil.

Senna may be given in the form of the syrup of senna pods or as compound liquorice powder. These preparations are easily taken, but they are more apt to

cause griping than castor oil. They must always be used fresh.

Compound jalap powder is much used, and is not unpleasant to take. It is, however, unreliable in its action. Jalapin is more certain and may be given in doses of 2 to 5 grs. to children of two years old and upward.

Rhubarb may be given to older children in cachets, and for younger children the syrup is a convenient form.

Carlsbad salts (a teaspoonful) is a useful form of saline purge for children over four, and a tablespoonful of any of the aperient waters may be given with an equal quantity of hot water or hot milk.

Hypodermic Injection of Medicine.—It is not very often that we are called upon to use a hypodermic syringe in treating young children, the pain of the prick rendering this method of medication inadvisable when the remedy can be given otherwise. Subcutaneous injections are, however, extremely useful in certain serious and acute conditions. For example, morphine may be injected in convulsions and cholera infantum, atropine in cases of opium poisoning, and ether and strychnine in certain collapsed conditions.

Hypodermic Injection of Saline Solution.—The injection of sterilised salt solution into the subcutaneous tissue is often of great value in cases where much fluid has been removed from the body by continued vomiting or diarrhœa.

The necessary apparatus for giving such injections consists in a needle, about the size used for exploring the chest, two feet or so of tubing, and, for a funnel, the outer part of a 2 oz. glass syringe. The fluid used is a $\frac{3}{4}$ per cent. solution of sodium chloride, and it, as well as the apparatus, must of course be sterilised by boiling.

The fluid should be considerably above the body temperature to begin with, because it is rapidly cooled in the funnel and tube. When filled, the funnel should be covered com-

pletely with cotton-wool, and part of the tube may be allowed to lie in a basin of hot water. The needle may be inserted into the subcutaneous tissue in any convenient part of the body. The back, pectoral regions, abdominal wall, and thighs are the best places. From one to six ounces of fluid may be used at a time. Generally, however, from two to three ounces is sufficient. The funnel is suspended about a foot above the patient and the solution is allowed to flow in very slowly. In most cases no pain whatever is caused after the needle is in place. In some children, however, the distension of the tissues seems to hurt a good deal. The skin should be carefully covered with cotton-wool during the injection, as it is apt to get very cold. The puncture is closed with collodion.

Applications of Drugs to the Skin in the form of fomentations and compresses are to be used with great caution in childhood. Carbolic acid is especially dangerous, because of the ease with which it is absorbed through the skin and from raw surfaces. It is probable that in some of the cases of burns which end fatally death is due largely to the absorption of antiseptic drugs from the surface.

Applications to the Throat.—Morbid conditions of the pharynx and tonsils are generally most satisfactorily treated by the application, with a large brush, of some bland application which will do no harm if it is swallowed. In some children a spray may be used, but in most the brush is more effectual. Gargling should not be ordered for children under seven years, and if it is prescribed at all, care must be taken to make sure that the child understands how to do it.

Applications to the Nose and Naso-Pharynx.—There are various ways of applying alkaline and antiseptic lotions to the nasal cavities and through them to the naso-pharynx. The lotion may be sniffed up by the child from his own

palm, or may be gently poured into the nostrils from a spoon, the head being tilted back slightly. The best way, however, in young infants is to drop the liquid into the nose by means of an ordinary medicine dropper, while the child is lying on his back. A suitable lotion is composed of 10 grs. each of boric acid and bicarbonate of soda and 2 grs. of chloride of sodium to the ounce of water.

The Mechanical Treatment of the Stomach

The mechanical treatment of the stomach has a wider application in young children than in adults. It may be considered under two heads: 1. Forced feeding, or gavage; 2. Stomach-washing, or lavage. Both these measures are simple of application and of great value in suitable cases as a means of treatment.

1. Forced Feeding, or Gavage

Methods and Apparatus.—There are a great many devices by the use of which fluid food or medicine can be introduced into the stomach of a child who is unable or unwilling to swallow. In some of these the nose is used as the way of access to the pharynx. In others the food is passed through the mouth.

(*a*) *Nasal Feeding.*—Three methods may be described. The first and the simplest of these consists in pouring a bland form of liquid nourishment into one nostril, through which it rapidly finds its way to the pharynx, and is inevitably swallowed. The child should be kept lying on his back and his head held steady. The food given must of course be quite unirritating in character (*e.g.* milk). It is poured into the nose by means of a glass ear syringe, over the nozzle of which a small piece of indiarubber tubing has been fitted; or a special spoon may be used, the sides of which are folded over near the point so as to form a

kind of narrow spout. The process of feeding must take place slowly, and regular intervals must be allowed for swallowing.

The second method resembles the first in all respects, except that to the nozzle of the syringe is attached a soft rubber tube long enough to be passed through the nasal cavity to the pharynx.

It is used when the fluid given is of such a nature that it would irritate the delicate mucous membrane of the nose. When the fluid is bland, the first method is preferable, as the passage of the rubber tube is itself a cause of irritation.

The third method consists in the passage of a tube through the nose, pharynx, and gullet into the stomach. For this a soft rubber catheter (No. 12 or 13—French) is suitable. It is thoroughly lubricated, and passed into the nostril with the patient lying on his back, or in older children while he is sitting up. When the end of the catheter reaches the pharynx, there is often retching and some resistance is felt. The patient's head should then be inclined slightly forward and the tube pushed gently on. As it gains the œsophagus, it generally ceases to irritate the pharynx, and soon the passage of gas and liquid from its upper end indicate that it has reached the stomach.

The catheter may pass into the larynx, but this does not often happen; its occurrence is announced by coughing and dyspnœa. More frequently it passes into the mouth, and this is likely to occur if there is much coughing and retching while the end of the catheter is passing the pharynx. When the catheter has reached the stomach and the retching has stopped, the food is introduced into it by a funnel or syringe.

The best funnel for this, and for any similar purpose, in children is formed by the barrel of a glass syringe with a

fairly wide nozzle. It fits into the catheter easily, and should any obstruction occur, the piston may be introduced to help to clear it away. When the catheter is being withdrawn, its end must be tightly compressed lest its contents get into the larynx in passing.

(*b*) *Forced Feeding by the Mouth.*—1. This is generally carried out by the passage of an œsophageal tube into the stomach. The apparatus required is the same as that used for stomach-washing, viz. a soft rubber catheter, connected, by a small piece of glass tube and a foot and a half of rubber tube, with a funnel large enough to hold from three to six ounces. The size of the catheter used varies with the age of the child from 14 to 20 (French), and it should be provided with one or two extra eyes.

The child is placed on his back, his head being held steady by an assistant. The left forefinger is then placed lightly on the tongue to depress it, while with the right hand the catheter is passed down the pharynx for eight to ten inches. The funnel is raised for a few minutes to allow the escape of gas, and the food is then poured into it and rapidly finds its way into the stomach. When the funnel empties, the tube is tightly compressed and rapidly but gently withdrawn. If the withdrawal of the catheter is done slowly or clumsily, it is apt to excite vomiting.

In infants who have no teeth, or only one or two, no gag is required. In older children some sort of a gag is necessary, as there is danger of the tube being bitten, and in them the process is much more difficult and not so generally useful.

2. A simpler form of forced feeding, first recommended by Scott Battams,[1] often proves of great value. For this all that is necessary is an ordinary glass syringe, to the nozzle of which four inches of rubber tube are attached. The child,

[1] *Lancet*, June 16 and 23, 1883.

who is refusing food or who for some reason is not to be allowed to suck, is laid on his back, the tube is passed towards the back of the mouth, and the liquid is gently injected. In older children, who clench their jaws, the tube may easily be passed backwards between the teeth and the cheek, and the liquid in this way reaches the pharynx readily.

Indications for Forced Feeding.—The indications for forced feeding in children are many and various, and the method chosen must depend on the requirements of the case in hand and the nature of the fluids to be administered.

1. In the rearing of premature infants, periodic feeding, either through the nose with a spoon or by means of a catheter passed through the mouth, has been found of great use (Tarnier).

2. Similarly, in young infants and others who are so weak that the effort of sucking and swallowing exhausts them, great benefit may be got from forced feeding either through the nose or preferably by Mr. Scott Battams' method.

3. In some cases of prostration (*e.g.* in enteric fever) there is obstinate refusal of all food and medicine to an extent which seriously endangers life. These cases may be effectually treated by one of the methods of nasal feeding, or preferably by the syringe and short tube.

4. The same methods are very serviceable in cases where swallowing is interfered with by pain due to ulceration of the mouth or throat.

5. Some years ago, Dr. Kerley[1] drew attention to the fact that regular forced feeding by means of an œsophageal tube passed into the stomach was extremely useful in persistent vomiting in infants. Babies who are not able to retain a teaspoonful of fluid swallowed in the ordinary

[1] "Gavage in the Treatment of Persistent Vomiting in Infants," *Archives of Pediatrics*, Feb. 1892, p. 85.

way can usually retain a much larger amount of nourishment if it is poured into the stomach through a catheter. The explanation of this remarkable fact is obscure, but of the value of its application in practice there can be no doubt.

6. In cerebral cases, in cases of narcotic poisoning, and in convulsive conditions such as tetanus, where there is interference with the process of swallowing, life may be prolonged and sometimes saved by forced feeding with a tube either through the nose or mouth. In the same way, in diphtheritic paralysis affecting the pharynx, feeding through a tube is of the greatest value.

2. STOMACH-WASHING, OR LAVAGE

Methods and Apparatus.—A soft rubber catheter connected with a funnel by eighteen inches of tube constitutes the best apparatus for stomach-washing, as for gavage. The catheter used should be the largest that can be easily passed, and should have two or three eyes. Lukewarm $\frac{3}{4}$ per cent. salt solution is probably the best fluid to use.

The patient is made to sit or lie on his mother's knee, with his face looking towards her left side and his clothes protected by a mackintosh sheet. A slight pressure on his chin generally makes him open his mouth, and the catheter is then passed gently backwards over the tongue and down the œsophagus as already described (p. 586). When the stomach is reached, the funnel is momentarily raised to allow any gas present there to escape, and then the water is poured into it out of an ordinary jug.

In doing this one must be careful, especially in delicate children, not to overdistend the stomach by running in too much water at a time, or by holding the funnel too high. When a sufficient amount of fluid has been introduced, the funnel is lowered, and the contents of the stomach rapidly

fill it by syphon action and are emptied into a pail. The tube is then pinched to prevent the entrance of air, the funnel raised again and refilled, and the process of washing-out repeated. It should be continued until fragments of curd, etc., cease to be found in the returning fluid.

Indications for Stomach-Washing.—1. In "summer diarrhœa" or "milk infection," and in other forms of irritant poisoning, stomach-washing combined with irrigation of the lower bowel constitutes the most rational and successful preliminary treatment; and it is practically without danger if carefully carried out.

2. In all forms of chronic vomiting of gastric origin in children, irrigation of the stomach may be useful; but, owing to the practical difficulties met with in its application to older children, its use is mainly confined to babies. In many cases one washing-out is sufficient to initiate improvement in the symptoms; in others, the process may have to be repeated daily for several days.

Not infrequently, an infant who has been vomiting several times a day for weeks is quite cured by one washing-out of the stomach. This is often so even where, owing to blocking of the tube with curd, the irrigation has been very imperfectly done. It has also been found that in some cases the mere passing of the stomach tube and holding it in position for a minute or two exerts a favourable influence on the vomiting. While a satisfactory explanation of this curious fact is not apparent, it has been observed sufficiently often to make it certain that the improvement that follows is more than a mere coincidence.

The Mechanical Treatment of the Bowel

Our objects in making local applications to the bowel are five in number. *Firstly*, to stimulate it to evacuate its

contents. *Secondly*, to cleanse, soothe, or otherwise act on its mucous membrane. *Thirdly*, to soften retained fæces or to destroy parasites. *Fourthly*, to have food, fluid, or medicine absorbed from it without passing through the stomach; and *fifthly*, to reduce an intussusception or a prolapse of the rectum.

For these purposes we make use of suppositories, injections of various kinds, and irrigations.

Suppositories.—Various kinds of suppositories are used to stimulate the action of the bowel in constipation. The simplest of these consist of small paper cones or conical pieces of soap. These are very efficacious in many cases, and are unobjectionable provided the mucous membrane of the rectum remains quite healthy. The most active suppositories are those containing glycerine. They are useful for many cases; but they must not be persevered with too long, as they are apt to give rise to catarrh of the rectum, and sometimes seem to cause fissures and other troublesome complications.

Various medicinal substances which disagree with the stomach may be given in suppositories, but generally it is better to employ small injections. Nutrient suppositories are of no use in infancy.

Enemata.—Evacuant injections may be composed of plain soap and water or thin gruel. During the injection the child should lie on his side, the fluid (at a temperature of 100° F.) should be allowed to run in very slowly, and a certain amount of pressure exerted on the sides of the anus, so as, if possible, to help its retention for a few minutes. For the administration of all forms of rectal injection in children a glass funnel and catheter are much preferable to a Higginson's syringe.

Injections of glycerine are very efficacious in *constipation*. A teaspoonful may be used plain or mixed with an ounce

of warm water. In obstinate cases, from 2 drachms to an ounce of castor oil, or from 1 to 4 drachms of turpentine, may be added to an ordinary soap and water injection.

Injections of laudanum and starch are very useful in relieving *tenesmus* and some forms of *diarrhœa*. Two to three minims in half an ounce of starch may be used for a strong child of a year old. Subnitrate of bismuth (a teaspoonful or more in 4 to 6 oz. of water or mucilage) may be injected to soothe the mucous membrane of the lower bowel, and a solution of tannic acid (10 to 30 grs. to the pint) is recommended as an injection in cases of "summer diarrhœa" to render inert some of the animal poisons present in these cases. In the insomnia of acute disease (*e.g.* in pneumonia) a rectal injection of warm water is sometimes very efficacious.

When *hard masses of fæces* accumulate in the bowel, a preliminary injection of olive oil ($\frac{1}{2}$ to 1 oz.) is useful in softening them. It should, if possible, be retained for from four to six hours, and be followed by an ordinary soap and water enema.

To treat *thread-worms* effectually generally requires the use of enemata combined with internal treatment (p. 150).

The administration of *medicine* by the bowel is sometimes useful in an emergency when the patient is unable to swallow (*e.g.* chloral in a case of convulsions). It is also recommended in the case of some medicines which are difficult to give by the mouth because of their taste or their action on the stomach.

Nutrient enemata are of comparatively little use in early childhood, as in the cases where they might be useful they are often not retained satisfactorily.

Saline rectal injections, given to allay thirst and to supply fluid to the tissues, form a most valuable therapeutic measure —especially in young babies.

The apparatus necessary for giving such injections consists in the barrel of a glass syringe attached to a small rubber catheter. The catheter is gently introduced for a couple of inches into the bowel, and the salt solution ($\frac{3}{4}$ per cent.), which must be at blood heat, is allowed to run in very slowly. The catheter is compressed from time to time so as to moderate the flow. When the fluid has entered the bowel, the catheter is withdrawn and the nates are held firmly together for a minute or two. When the rectum is very irritable, as often happens, it may be necessary for the nurse who is giving the injection to take half an hour or longer in its administration. In some very irritable cases the fluid will be ultimately well retained if the nurse allows only a few drops of the fluid to enter at a time and compresses the nates for many minutes at the end.

The right amount of saline to be injected varies in different cases, because it depends on the degree of sensitiveness of the particular child and not merely on the capacity of the rectum. Infants of a few weeks can usually retain from six drachms to one ounce, and sometimes, with care, as much as two ounces. Older children may retain much larger amounts. The injections may be repeated every four hours. Stimulants may be given in the injection, and are well borne if freely diluted.

Some of the indications for this method of treatment are as follows:—

1. In premature and extremely weak babies who are threatening to die from sheer debility, occasional rectal saline injections are a valuable aid to the use of the incubator and forced feeding.[1]

2. They may also be useful in any diseased condition

[1] Pery, "De la débilité, congénital et acquise, des nouveau-nés," *Thèse de Bordeaux*, 1903.

in newly born or other weakly children (*e.g.* birth injuries, septic conditions, hæmorrhage, etc.).

3. They are particularly valuable in cases where the child is unable to retain fluid taken by the mouth, as in pyloric hypertrophy and other conditions accompanied by severe vomiting, and after surgical operations when fluids are not allowed by the mouth.

4. Large enemata of plain water form a valuable diuretic measure in cases of acute nephritis.

Injection of air or of water into the colon, under chloroform, is frequently successful in reducing intussusception if it is of recent occurrence.

Irrigation of the Lower Bowel.—To irrigate the colon, an ordinary douche apparatus, such as is used in obstetric practice, is required, with a large-sized rubber catheter at the end of the tube. The child is laid on a bed or table or on his nurse's knee in the lithotomy position, and a large mackintosh sheet is placed under him draining into a pail below. The douche can is fixed four or five feet above the child. The catheter is then oiled and placed within the anus before the water is turned on. As the water flows, the catheter is passed steadily upwards for 12 or 14 inches, if possible.

At six months old, the colon will hold a pint without distention; and, at the age of two years, from two to three pints (Holt). As the irrigation proceeds, the water begins to be forcibly expelled by the side of the catheter, and the process should be continued until the water which returns is tolerably clean. At least a gallon of water should be used for each irrigation. After the injection is over, the water should be allowed to run out of the catheter, and it should be left in for a few minutes for this purpose. A considerable proportion of the injecting fluid is usually retained for some time.

Irrigation is useful in effecting the thorough clearing out of the lower bowel.

It is soothing to the mucous membrane and has a beneficial effect in various forms of diarrhœa and also in some cases of recurrent colic. Plain water or solution of salt (a teaspoonful to the pint) seems to be as efficacious as an antiseptic solution.

Cases of catarrhal jaundice which are threatening to become chronic are sometimes greatly benefited by the daily administration of a cold water irrigation. For this purpose the water may be used between 65° and 85° F.

APPENDIX A

METHOD OF CASE-TAKING

Name—Age—Parent's occupation—Address—By whom recommended. Date of admission. Date of examination. Date of discharge.

Complaint, on account of which the child has been brought. Its duration.

Family History.—Health of parents and near relatives (rheumatism, tubercle, nervous and mental disease, syphilis, etc.)—Mother's health during pregnancy, and facts as to previous pregnancies—Miscarriages—Number of other children alive, their ages and health; number dead, their ages and cause of death.

Hygienic Surroundings.—Dwelling-house (situation, size, ventilation, light, warmth, dampness)—Number sleeping in one room—Amount of open-air exercise.

Previous Health.—Nature of labour—Condition of child at birth—Feeding during infancy (breast or bottle—exact details)—Later feeding—Dates of teething and of beginning to walk and speak—Usual state of digestion and bowels—Sleep—Signs of congenital syphilis—Fits (number, character, and date of occurrence)—Rickets—Attacks of diarrhœa, vomiting, bronchitis, sore throat, otorrhœa, enlarged glands—Infectious diseases and age at which they occurred (measles, whooping-cough, scarlet fever, chicken-pox, etc.)—Possibility of recent contagion.

Present Illness.—Date of commencement, and whether sudden or gradual—Health immediately before—Supposed or possible causes (injury, chill, improper feeding, etc.)—Symptoms noticed in order of appearance, *e.g.* languor, wasting, irritability, debility, loss of appetite, thirst, vomiting, diarrhœa or constipation, cough (its character and time of occurrence), pain, laryngismus, convulsions (general or local), perspiration, fever, breathlessness, sore throat, disturbed sleep, drowsiness, etc.

State on Examination.—Height—Weight.

A. General Inspection, Palpation, and Extra-Auscultation.

Appearance (if healthy or otherwise)—Nutrition and development—Complexion (anæmia, cyanosis, jaundice, etc.)—State of skin (dryness, moisture, eruptions, desquamation, pigmentation, œdema)—Attitude, expression, demeanour, temper.

Shape of head, and state of its ossification (fontanelle, craniotabes)—Facial irritability—Hair—Eyes, nose, and ears (formation of, and if any discharge from)—Neck—Shape of thorax, abdomen, back, and limbs (especially the hands)—Enlarged glands—Evidence of rickets, syphilis, and tuberculosis.

Character of voice, cry, and cough—Rate and character of respiration (if noisy, dyspnœic, or painful)—Movements of alæ nasi—Rate and character of pulse—Temperature.

Palpation of abdomen (tenderness, resistance, fluid, size of liver and spleen, tumours, etc.).

B. Further Detailed Examination of Systems. *N.B.—The systems found to be affected should be taken first, but* IN ALL CASES *the urine, heart, lungs, abdomen, and throat must be examined and their condition recorded.*

Respiratory System

Thorax (form, measurement, movements, retraction).
Palpation (position of heart's apex beat, fremitus).
Auscultation—Percussion—Exploratory puncture—Sputa.

Circulatory System

Inspection of præcordia, epigastrium, and neck (form, pulsation, &c.).
Palpation (position, character, and force of heart's apex beat and other pulsations, thrills). Auscultation—Percussion.

Hæmopoietic System

Spleen (palpation, percussion), lymphatic glands, thymus, thyroid, blood.

Genito-Urinary System

Micturition (control of bladder, dysuria)—Examination of kidneys, bladder, and external genitals (phimosis, hernia, etc.).
Urine (amount and characters, including microscopic examination).

Skin

Eruptions (distribution, type, itchiness, enlargement of neighbouring lymphatic glands).

Locomotor System

Joints, epiphyses, shafts, muscles.

Nervous System

Cranium (size and shape)—Fontanelle (shape, edges, tension, level, pulsation, and size). Spine (form, pain, rigidity, retraction of head).
Mental condition—Drowsiness, stupor, coma, disturbances of sleep, irritability, excitement, delirium, attention, memory, intelligence, speech.

Motor Functions—Muscles (development of), paralysis.
Involuntary movements (tremor, chorea, spasm—tonic, or clonic, convulsions).
Voluntary movements (strength and co-ordination).
Holding up head, sitting up, standing, walking, grasping.
Electrical reactions.
Reflexes—superficial, deep, organic.

Sensory Functions—Subjective sensations, sensibility to touch, pain, and temperature, tenderness (local or general).

Vasomotor and Trophic Functions.

Eyes—Sight, photophobia, conjunctiva, cornea, pupils (size, shape, and reaction), nystagmus, strabismus, ptosis, muscular paralysis, ophthalmoscopic examination.

Ears—Pain, discharge, hearing, otoscopic examination.

Nose—Smell, taste.

Digestive System

Lips, mouth, tongue, gums, teeth, palate, tonsils, fauces, pharynx, adenoids.
Thirst, appetite, vomiting, state of bowels, vomited matters, fæces.
Abdomen (further inspection, palpation, percussion). Rectal examination.

Diagnosis. Treatment and progress. Result.
In case of death, copy of pathologist's report.

APPENDIX B

The following facts are taken from the Clinical Society's *Report on the Periods of Incubation and Contagiousness of Certain Infectious Diseases*, London, 1892, and from the *Code of Rules* issued by the Medical Officers of Schools Association, Fourth Edition, London, 1899 :—

Diphtheria

Incubation Period.—This generally lasts two days, seldom exceeds four days, probably never longer than seven days.

Infective Period.—The patient is infectious (*a*) in the incubative stage ; (*b*) during the developed attack ; (*c*) for a varying and uncertain period after apparent recovery. Bacteriological examination is necessary to determine when the infective period is really at an end.

Persistence of Infection.—The infection can be retained in clothes, carpets, and other fomites for months, perhaps years.

Enteric Fever

Incubation Period.—Its duration varies very much. Generally lasts from twelve to fourteen days ; may be only eight or ten days, or

possibly even less; in rare cases, fifteen, eighteen, or twenty-three days.

Infective Period.—This lasts from the onset of the first symptoms until convalescence has been established for at least a fortnight.

Persistence of Infection.—Fomites retain the infection for two months at least.

Influenza

Incubation Period.—This usually lasts three or four days, but varies from a few hours to five days in duration.

Infective Period.—The patient may convey infection during the whole course of the illness, *i.e.* for a week or ten days.

Measles

Incubation Period.—This usually lasts for nine or ten days; rarely, only for four or five, or for as long as fourteen days. Generally the rash appears on the fourteenth day from the exposure to infection.

Infective Period.—Measles is very infectious during the primary period, and probably not less so during the whole acute attack. The infection may last for almost two weeks from the beginning of the rash.

Persistence of Infection.—Fomites are probably capable of retaining the infection for a short time.

Mumps

Incubation Period.—The interval between the exposure to infection and the commencement of parotitis is generally three weeks, a day more or a day or two less. It is occasionally as long as twenty-five days, or, more rarely, as short as fourteen days. The beginning of the prodromal stage is so difficult to ascertain, and so uncertain in duration, that the commencement of the illness is usually dated from the appearance of the parotitis.

Infective Period.—This begins with the beginning of the prodromal stage, which may last four days; is very active at the time of onset of the parotitis; diminishes progressively from that time, and ceases probably within a fortnight and certainly within three weeks of that date.

Rubeola (*German Measles*)

Incubation Period.—This lasts for eighteen days usually, but may be as long as twenty-one, or rarely as short as five or six days.

Infective Period.—The patient is infectious for two or three days before the rash appears and when it is out. The infection is probably over in a week in mild cases, and by the time desquamation is over in the more severe.

Scarlet Fever

Incubation Period.—This usually lasts for more than twenty-four and less than seventy-two hours. It is occasionally less than a day, and

sometimes longer than three days; it probably never exceeds seven days.

Infective Period.—It is infectious from the onset of the earliest symptoms, and remains so until desquamation is completed, sometimes for as long as eight weeks. If there is any otorrhœa, or suppurating wound, or eczematous patch, the discharge from these may continue very infectious for a long time after desquamation has ceased.

Persistence of Infection.—The infection is readily preserved in, and conveyed by, fomites.

Smallpox

Incubation Period.—This is commonly twelve days, but is not very infrequently a day more or less. It is occasionally only nine or ten days, and sometimes fourteen or perhaps fifteen days.

Infective Period.—The patient is infectious from the onset of the first symptoms until all scabs have cleared off, and most infectious during the height of the active stage of the disease.

Persistence of Infection.—Fomites readily carry and retain the infection.

Varicella

Incubation Period.—This lasts generally for fourteen days, but may be a day less or four or five days more.

Infective Period.—The infection may be derived from a patient at least as soon as the rash appears. A convalescent patient may convey the infection to others so long as any scabs are left on the body or scalp. The infection may probably be conveyed in clothes, but is certainly not long retained by them.

APPENDIX C

DIRECTIONS TO MOTHERS RESPECTING PARALYSED CHILDREN

LOWER LIMBS

Clothing

They must be kept warm day and night.

Knitted woollen stockings to come up above the knees.

If these don't keep the limbs warm, woollen overalls to be worn outside the stockings. The overalls to come up the thighs.

If these are not sufficient to keep the limbs warm, the overalls must be lined with cotton wadding, which is to be quilted so as to hold fast to the overalls.

For the night a flannel sack made the shape of the leg and coming up to the top of the thigh is the best. This sack should be lined with cotton wadding.

Rubbing

For a quarter of an hour twice daily.

Set the child on a chair, or lay it on the bed, or let it sit on somebody's knee.

1st. Rub the paralysed leg from the foot right up to the top of the thigh. Rub upwards only. Put the broad part of your hand on the back of the child's leg. In rubbing the thigh you may put your hand first on the back of the child's thigh and afterwards on the front of its thigh. But always rub upwards and be sure to go as high as the child's loins. Whilst rubbing with your right hand, hold the child's foot with your left. Use for rubbing any kind of oil.

2nd. Take hold of the child's leg with your two hands just above the ankle. Rub round the leg with your two hands in the opposite direction as though you were wringing out some sheets. Work up the leg and thigh from the foot up to the top of the thigh in the above manner.

3rd. Take the child's calf with your two hands. Put your fingers to the back of the leg and your thumbs to the front. Squeeze the soft parts out between your fingers and thumbs so as to flatten the leg out and make it as wide as possible. Work right up the leg and thigh in this manner.

4th. Put your right hand over the front of the child's knee. Put your left hand against the child's foot. Push up the child's foot, and, holding your right hand in front of the child's knee, you will prevent yourself doing any harm. You want, if possible, by pushing the child's foot, to make the child push against your left hand with all its might. *This is the most important of all the exercises.*

5th. Flip every part of the leg and thigh with your fingers, so as to make the whole of the limb quite red and warm.

6th. Gently rub up and down all over. This will take the stinging away which was left by the last movement.

Baths

Once a day let a large jugful of hot water containing two handfuls of salt be poured down the leg and thigh.

Then pour about half the quantity of cold water over the leg and thigh.

Then rub thoroughly dry with a towel, and continue to rub until the limb is perfectly warm.

APPENDIX D

DIRECTIONS TO MOTHERS OF MENTALLY DEFECTIVE CHILDREN

Your child needs to be carefully taught to do things that other children do without teaching. In time he may learn to do them quite well if you only persevere.

Remember that improvement *cannot* be sudden; it can only come gradually by getting him to do over and over again little things that he is not good at. Notice, therefore, what things he cannot do as well as other children, and try to teach him to do them better one by one. Do not go on doing for him anything that you can possibly get him to do for himself—such as feeding or dressing.

Encourage him especially in doing those things that he finds a *little* difficult, but do not give him anything to do that is quite too hard for him. Utter failure will discourage him, while success in *anything* that is not mischief will do him a great deal of good.

Always encourage anything harmless that he does of his own accord. Such things please him far more than what you tell him to do, and are also better for him; but *never* let him even begin to get into a habit of making faces, or of making any noises that you would not like your other children to learn.

If he seems to notice too little, encourage him to look at, listen to, or handle anything that he is taken up with. Any sort of interest helps to brighten him.

Do your best to keep his body as strong as possible by carefully seeing to his food and clothing, and by taking him into the fresh air as much as you can.

Nobody knows how much he may improve; that will depend largely on the amount of trouble and patience you spend on him.

APPENDIX E

FORMULÆ

F. 1, p. 50.

Heavy Carbonate of Magnesia	3 ounces
Powder of Florentine Iris	1 ounce
Otto of Roses	3 drops

Tooth Powder.

F. 2, p. 50.

Precipitated Chalk	2 ounces
Light Magnesia	2 ounces
Oil of Cinnamon	8 drops
Thymol Crystals	4 grains
Otto of Roses	10 drops

Tooth Powder.

F. 3, p. 105.

Bicarbonate of Soda	3 grains
Aromatic Spirit of Ammonia	1 minim
Spirit of Chloroform	1 minim
Syrup	10 minims
Dill Water up to	1 drachm

After each meal.

F. 4, p. 105.

Bicarbonate of Soda	2 grains
Papain (Finckler)	1 grain

Before each meal.

F. 5, p. 118.

Mercury with Chalk	$\frac{1}{6}$ to $\frac{1}{4}$ grain
Bicarbonate of Soda	$\frac{1}{2}$ grain
Subnitrate of Bismuth	2 grains

Every two or four hours.

F. 6, p. 118.

Carbonate of Bismuth	2 grains
Bicarbonate of Soda	2 grains
Compound Tragacanth Powder	$1\frac{1}{2}$ grain
Spirit of Chloroform	1 minim
Caraway Water up to	1 drachm

Every two or four hours.

F. 7, p. 118.

Castor Oil	5 minims
Mucilage of Gum Acacia	15 minims
Syrup	30 minims
Peppermint Water up to	1 drachm

Three or four times a day.

F. 8, pp. 120, 143.

Subnitrate of Bismuth	8 grains
Compound Tragacanth Powder	6 grains
Prepared Chalk	2 grains
Water	1 drachm

Before each meal.

F. 9, p. 120.

Creosote	$\frac{1}{6}$ minim
Syrup of Tolu	20 minims
Camphor Water up to	1 drachm

Before each meal.

F. 10, p. 148.

Bicarbonate of Soda	3 grains
Tincture of Nux Vomica	1 minim
Compound Infusion of Gentian up to	1 drachm

Ten minutes to half an hour before each meal.

F. 11, p. 148.

Sulphate of Magnesia	$2\frac{1}{2}$ grains
Dilute Sulphuric Acid	1 minim
Sulphate of Iron	$\frac{1}{4}$ grain
Syrup of Ginger	2 minims
Peppermint Water up to	1 drachm

Thrice daily after food.

F. 12, pp. 182, 187.

Prepared Calamine	80 grains
Zinc Oxide	40 grains
Glycerine	10 minims
Boric Acid	15 grains
Distilled Water up to	1 ounce

F. 13, p. 182.

Salicylic Acid	7½ grains
Zinc Oxide	120 grains
Starch, in Powder	120 grains
Soft Paraffin (white)	120 grains
Hydrous Wool Fat	120 grains

F. 14, p. 190.

β Naphthol	15 parts
Prepared Chalk	10 parts
Soft Soap	50 parts
Lard	100 parts

F. 15, p. 280.

Ipecacuanha Wine	5 minims
Spirit of Nitrous Ether	5 minims
Solution of Acetate of Ammonia	30 minims
Cinnamon Water up to	1 drachm

Every three or four hours.

F. 16, p. 280.

Carbonate of Ammonia	1 grain
Ipecacuanha Wine	5 minims
Syrup of Tolu	30 minims
Cinnamon Water up to	1 drachm

Every three or four hours.

F. 17, p. 284.

Oil of Turpentine	1 drachm
Compound Camphor Liniment up to	2 ounces

F. 18, p. 290.

Oil of Amber	4 drachms
Oil of Cloves	4 drachms
Olive Oil up to	2 ounces

F. 19, p. 290.

Camphorated Tincture of Opium	3½ minims
Ipecacuanha Wine	5 minims
Syrup of Squills	30 minims
Infusion of Serpentary up to	1 drachm

Every three or four hours.

F. 20, p. 465.

Tannic Acid	30 grains
Carbolic Acid	30 minims
Glycerine up to	1 ounce

F. 21, p. 465.

Iodine	6 grains
Iodide of Potash	12 grains
Peppermint Oil	4 minims
Glycerine up to	1 ounce

F. 22, p. 485.

Tincture of Calumba	5 minims
Cod Liver Oil	30 minims
Lime Water	30 minims

Thrice daily after food.

F. 23, p. 485.

Cod Liver Oil	18 minims
Syrup of the Lactophosphate of Lime	18 minims
Lime Water	18 minims
Hypophosphite of Soda	1 grain
Mucilage of Gum Acacia	5 minims
Oil of Cassia	⅓ minim

Thrice daily after food.

F. 24, p. 486.

Phosphorus	1 grain
Absolute Alcohol	350 minims
Spirit of Peppermint	10 minims
Glycerine up to	2 ounces

Six to twelve drops thrice daily after meals.

F. 25, p. 486.

Phosphorus . . .	$\frac{1}{6}$ grain
Almond Oil . .	1 ounce
Gum Acacia . .	4 drachms
White Sugar . .	4 drachms
Distilled Water .	$1\frac{1}{2}$ ounce

One teaspoonful (or two) thrice daily after meals.

F. 26, p. 487.

Phosphorus . .	$\frac{1}{7}$ grain
Cod Liver Oil . .	3 ounces

A teaspoonful thrice daily after meals.

F. 27, p. 580.

Butyl Chloral Hydrate	1 grain
Glycerine . .	10 minims
Peppermint Water up to	1 drachm

APPENDIX F

RECIPES

Arrowroot Water.—Rub up a teaspoonful of arrowroot with a tablespoonful of cold water until smooth ; pour on it, while stirring, a pint of boiling water, and boil for five minutes.

Barley Jelly.—Put two tablespoonfuls of *washed* pearl barley into a pint and a half of water, and slowly boil down to a pint ; next strain out the barley, and let the liquid settle into a jelly. Two teaspoonfuls of this, dissolved in eight fluid ounces of warmed and sweetened milk, are enough for a single feeding.

Barley Water.—Put two teaspoonfuls of *washed* pearl barley into a pint of cold water, boil down to two-thirds of a pint, and strain through muslin. It should be made twice a day, as it will not keep.

Beef Tea.—Mince one pound of lean beef, and add to it one pint of pure cold water and ten drops of dilute hydrochloric acid ; let it stand for two or three hours, with occasional stirring, and then simmer for ten to twenty minutes.

Brandy and Egg Mixture.—Rub up the yolks of two eggs with a tablespoonful of white sugar, and add four tablespoonfuls of brandy and eight of cinnamon water. Dose, one teaspoonful to one tablespoonful.

Bread Jelly.—Take four ounces of stale crumb of bread and break it into small pieces ; cover with boiling water, and let it stand for six hours. Squeeze out the water and add fresh water to the pulp. Boil for an hour and a half ; squeeze out the water and pass the pulp through a fine hair sieve. On cooling, a jelly is formed. It may be given with sweetened milk, in the proportion of a tablespoonful to eight ounces. It must be prepared fresh twice daily, as it will not keep.

Malt Infusion.—Mix three full tablespoonfuls of crushed malt thoroughly with half a pint of cold water in a jug. Allow the mixture to stand overnight—ten or twelve hours. Decant off the supernatant liquid carefully from the sediment, and strain it through two or three folds of muslin, until it comes through fairly clear and bright. This should make about six ounces of malt infusion. It should be kept in a well-corked bottle, and a few drops of chloroform are to be added to it to preserve it. A dessertspoonful may be mixed with the food before it is taken, or be sipped along with it.

Oatmeal Water.—Take one tablespoonful of coarsely ground oatmeal; add a pint of water, and simmer gently for an hour; strain, and add sufficient water to replace that which has evaporated.

Raw Meat Juice.—Mince finely the best rump steak; add cold water in the proportion of one part of water to four of meat. Stir well together, and allow to soak for half an hour, cold. Forcibly express the juice through muslin by twisting it.

Sherry Whey.—To half a pint of milk, whilst boiling in a saucepan, add one wineglassful of sherry, and afterwards strain; sweeten with pounded sugar to taste.

Veal Tea.—Take a pound of minced veal, free from fat; mix with a pint and a half of water or barley water; heat in a slow oven for three hours; strain and skim.

White of Egg Water.—Take the white of a fresh egg; cut it in various directions with a clean pair of scissors. Shake it in a bottle with a pinch of salt and half a pint of cold water. Strain through muslin.

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